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Normobaric Hypoxia as a Cognitive Stress Test for Mild Traumatic Brain Injury: Oculometrics, Pulse Oximetry, and the Self-Report of Symptom Severity

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14. ABSTRACT

The present report describes research assessing the effects mild hypoxia has on individuals with a medical history of mild traumatic brain injury (mTBI). The research tests the hypothesis that individuals who have a history of mTBI but who are asymptomatic may have latent deficits that become apparent in the presence of relatively minor physiological stressors routinely encountered by military personnel or by civilians during normal daily activities. The research used a minor, altitude-referenced hypoxic challenge as a prototypical physiological stressor. The present report describes the methodology used to generate the hypoxic challenge as well as the experimental design and procedures. Two groups of 36 subjects were studied; one group with a history of mTBI and one group with no such history. The report describes the characteristics of the study volunteers who were matched on the basis of such variables as age, gender, body mass index, and smoking behavior. The response parameters included oculometric, pulse rate, pulse oximetry, a self-report inventory of subjective symptoms, and neurocognitive assessments.

15. SUBJECT TERMS

normobaric hypoxia, mild traumatic brain injury, mTBI, neurocognitive stress, pulse oximetry, oculometry

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The present report provides an extensive tabulation of the oculometric, pulse rate, pulse oximetry and inventory of subjective symptoms data as well as statistical summaries of these data and initial analyses. These initial analyses suggest that the oculometric instrumentation used in this study was insufficiently sensitive to expected differences whereas the pulse rate, pulse oximetry, and symptom severity data warrant further detailed analysis. A separate report addresses the neurocognitive assessments.

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Table of Contents

Page

Introduction....1
Background....1
Mild Traumatic Brain Injury Overview....1
Hypoxia and Mild Traumatic Brain Injury....5
Hypoxia Exposure in Civilian and Military Aviation....6
Civilian exposure to hypoxia in aviation....6
Military exposure to hypoxia in aviation....7
Methods....9
Human Subject Volunteers....9
Experimental Design....12
Apparatus....13
Reduced Oxygen Breathing Device....13
Functional Impairment Tester....14
Dependent Variables and Response Measurements....14
Reduced Oxygen Breathing Device....14
Functional Impairment Tester....14
Subjective reports of hypoxic symptoms....15
Procedures....16
Results....18
Duration of Normobaric Hypoxic Exposures....18
Reduced Oxygen Breathing Device Measurements....19
Pulse oximetry: Percent blood oxygen....19
Correlations....21
Pulse rate....22
Correlations....23
Oculometrics, Functional Impairment Tester Measurements....25
Environmental Stress Questionnaire: Acute Mountain Sickness-Cognitive....28
Discussion....30
Conclusion....37
References....38
Appendix A. Mild Traumatic Brain Injury Group Description....41
Appendix B. Control Group Description....42
Appendix C. Percent Hemoglobin Oxygen Concentration and Pulse Rate for Each Mild Traumatic Brain Injury Subject at Each Altitude Condition....43
Appendix D. Percent Oxygen Percent Hemoglobin Oxygen Concentration and Pulse Rate for Each Control Subject at Each Altitude Condition....44
Appendix E. Oculometrics Recorded in the Mild Traumatic Brain Injury Subjects....45
Appendix F. Oculometrics Recorded in the Control Subjects....47
Appendix G. Correlation Matrix Among All Variables for the Mild Traumatic Brain Injury Subjects....49
Appendix H. Correlation Matrix Among All Variables for the Control Subjects....91

Table of Contents (continued)

List of Figures

Page

1. The reduced oxygen breathing device and tanked gases used to generate normobaric hypoxia....13
2. Functional impairment tester used to evaluate eye movements....14
3. Average percent hemoglobin oxygen concentration as a function of the altitude condition for the mild traumatic brain injury and control....20
4. Mean pulse rate as a function of altitude for the mTBI and control....23
5. Pupil diameter as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects and for the group of control subjects....27
6. Pupil response amplitude as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects and for the group of control subjects....27
7. Pupil response latency as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects and for the group of control subjects....28
8. Saccadic velocity as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects and for the group of control subjects....28
9. Environmental Stress Questionnaire responses recorded for the two groups of subjects as a function of altitude condition....29
10. Average Environmental Stress Questionnaire responses as a function of hypoxic condition. 36

List of Tables

1. Glasgow Coma Score....3
2. Summary of the Characteristics of the Mild Traumatic Brain Injury and Control Groups. 11
3. Mean Time to Complete Measurements at Each Altitude Condition....19
4. Mean Percent Hemoglobin Oxygen Concentration at Each Altitude Condition....20
5. Pearson Product Moment Correlation Matrix of Percent Hemoglobin Oxygen Concentration for the Mild Traumatic Brain Injury Group at Each Altitude Condition....21
6. Pearson Product Moment Correlation Matrix of Percent Hemoglobin Oxygen Concentration for Control Group at Each Altitude Condition....22
7. Mean Pulse Rate of the Two Groups of Subjects Measured at Each Altitude Condition. 22
8. Pearson Product Moment Correlation Matrix of Pulse Rate for Mild Traumatic Brain Injury Group at Each Altitude Condition....24
9. Pearson Product Moment Correlation Matrix of Pulse Rate for Control Group at Each Altitude Condition. 24
10. Mean Responses of the Mild Traumatic Brain Injury and the Control Subjects for Each of the Four Oculometric Response Parameters at Each Altitude Condition....25
11. Environmental Stress Questionnaire: Acute Mountain Sickness-Cognitive Sum of the Ratings for Each Question Item for the Mild Traumatic Brain Injury and Control Groups Over Each Altitude Condition....29

Introduction

The present report describes research assessing the effects mild hypoxia has on individuals with a medical history of mild traumatic brain injury (mTBI). The research was designed to test the hypothesis that individuals who have experienced an mTBI but are asymptomatic may have covert deficits revealed only in the presence of physiological stressors that may be relatively minor and routinely encountered by military personnel or by civilians during their daily activities. The present study uses a minor hypoxic challenge as a prototypical physiological stressor. The response metrics of the research included self-reports of subjective symptoms, oculometrics, pulse rate, pulse oximetry, and neurocognitive assessments. The present report describes the methodology used to generate the hypoxic challenge as well as the experimental design and procedures, and the characteristics of the subject volunteers. It also presents the results of the reports of subjective symptoms, oculometrics, pulse rate, and pulse oximetry; a separate, companion report in preparation will address the neurocognitive aspects of the study.

Background

Mild Traumatic Brain Injury Overview

There are numerous definitions and classification schemes for mTBI. Incidence and prevalence estimates can vary enormously, some based on hospital admissions for mTBI, while others assume that most mTBI cases never reach the hospital and therefore remain undocumented. An additional complication is semantic, the confusion between the terms *mTBI* and *concussion*, which are often used interchangeably with little formal or official distinction other than the tendency to use concussion to refer to the milder end of a continuum of brain trauma.

In the absence of uniform definitions for mTBI, and in light of the variety of classification criteria and prevalence data, we primarily rely on three sources to define, describe, and characterize mTBI; sources that reflect an emphasis on the concerns of military and veterans. These sources are; firstly, the Veterans Administration (Veteran's Health Initiative, Department of Veterans Affairs [Veteran's Health Initiative Department of Veterans Affairs, VA], 2004); secondly, the VA/Department of Defense (DoD) Clinical Practice Guideline for Management of Concussion/mTBI (The Management of Concussion/mTBI Working Group, 2009); and lastly, the Centers for Disease Control and Prevention (CDC) (CDC, 2010).

a. The VA provides a traumatic brain injury (TBI) Independent Study Course through the VA Employee Education System (Veteran's Health Initiative, VA, 2004), planned and implemented in accordance with Accreditation Council for Continuing Medical Education standards for the independent study of mTBI for VA clinicians and other interested VA staff. According to this training document, approximately 80% of the patients who sustain a TBI have previously had an mTBI. The course material references the idea that an mTBI injury triggers a pathological neurochemical cascade that is insufficient to produce widespread neuronal dysfunction or axonal disruption characteristic of more severe brain injuries. For a formal definition of mTBI, the course refers to the definition provided by the American Congress of Rehabilitation Medicine, summarizing it as:

1. Traumatically induced physiologic disruption of brain function as indicated by at least one of the following:

    A. Any period of loss of consciousness

    B. Any loss of memory for events immediately before or after the accident

    C. Any alteration in mental state at the time of the accident

    D. Focal neurologic deficits that may or may not be transient

2. Severity of the injury does not exceed:

    A. Loss of consciousness of 30 minutes (min)

    B. GCS* score of 13 to 15 after 30 min

    C. Post-traumatic amnesia of 24 hours (hr)

*The GCS referred to in this definition is the Glasgow Coma Score (Kraus & Chu, 2005), which is a 15-point scale based on the ranges of the patient's best eye opening, motor, and verbal responses. See Table 1 for more information about the GCS.

Table 1. Glasgow Coma Score

Responses	Score
Motor	
Obeys commands	**6**
Localizing responses to pain	**5**
Generalized withdrawal to pain	**4**
Flexor posturing to pain	**3**
Extensor posturing to pain	**2**
No motor response to pain	**1**
Verbal	
Oriented	**5**
Confused conversation	**4**
Inappropriate speech	**3**
Incomprehensible speech	**2**
No Speech	**1**
Eye	
Spontaneous eye opening	**4**
Eye opening to speech	**3**
Eye opening to pain	**2**
No eye opening	**1**
Total (sum of motor, verbal, and eye scores)	______

The definition provided by the VA training subsumes the spectrum of mild injuries typically referred to as concussion, explicitly extends into the mild range of TBI, and makes no reference to neuroimaging.

b. The VA/DoD Clinical Practice Guideline (The Management of Concussion/mTBI Working Group, 2009) recommends a flow-chart decision tree in which the initial determination is made that the individual presents with a head trauma resulting in alteration or loss of consciousness. Explicitly listed possible causes of the head trauma are blast or explosion, head striking or being struck by an object, and head undergoing acceleration or deceleration as may occur in a motor accident or during a fall. Following this determination and the proper referrals for emergency evaluation and treatment, the determination for concussion/mTBI is made based on the reported history. The specific criteria for concussion/mTBI include:

- Loss or a decreased level of consciousness for less than 30 min;

- Loss of memory for events immediately up to a one day after the injury;

- Alteration of consciousness/mental state for 0 to 24 hr after the injury;

- Normal structural imaging; and

- Glasgow Coma Scale score of 13 to 15 (best value determined within the first 24 hr, if available).

The VA/DoD Clinical Practice Guideline summarizes the post concussive/mTBI related symptoms that develop within 30 days of trauma as falling into the three following categories.

- Physical symptoms that include: headache, dizziness, balance disorders, nausea, fatigue, sleep disturbance, fuzzy or blurred vision, sensitivity to light, hearing difficulties/loss, sensitivity to noise, seizure, transient neurological abnormalities, and numbness tingling.

- Cognitive symptoms that include effects on: attention, concentration, memory, speed of processing, judgment, and executive control.

- Behavior/emotional symptoms that include: depression, anxiety, agitation, irritability, impulsivity, and aggression.

c. It is noteworthy that the CDC (2010) provides a listing of symptoms of concussion/mTBI that are essentially identical with the symptoms presented in the VA/DoD Clinical Practice Guideline. This CDC listing includes:

- Physical symptoms that include: headache, nausea or vomiting, balance problems, dizziness, fuzzy or blurry vision, feeling tired, having no energy, or sensitivity to light or noise;

- Symptoms effecting thinking and remembering, which include: difficulty thinking clearly, feeling slowed down, difficulty concentrating, or difficulty remembering;

- Mood and emotion related symptoms, which include: irritability, sadness, more emotional, nervousness, or anxiety; and

- Sleep disturbances, including sleeping more or less than usual and trouble falling to sleep.

To this, the CDC adds that the disturbance of brain function is typically associated with normal structural neuroimaging findings. The CDC estimates that about 1.7 million people sustain a TBI annually, with 275,000 resulting in hospitalization, 1,365,000 emergency room visits, and "about 75% of the TBIs that occur each year are concussions or some other form of mild TBI" (CDC, 2010).

Visual symptoms figure prominently in the CDC and VA/DoD discussion of TBI symptoms. The effects of TBI on the visual system is an active area of scientific research, in part due to the well-established connections among visual functions and capabilities (i.e., psychophysics), visual neurophysiology, and the known neuroanatomy of the visual system, which create the possibility that the visual system can provide a sensitive basis for the selective assessment of neurotrauma in any of the many regions of the brain known to be essential for specific functions that together comprise normal vision. One area of current research on the disruptive effects that mTBI has on vision involve eye movements, which include aspects of the coordination of the motion of the two eyes, which are essential for binocular vision. Another area of research addresses the behavior of the eyes' pupils, which are under the control of the autonomic nervous system, and has long been used as a sensitive diagnostic sign of the status of the sympathetic and parasympathetic systems. Assessments of eye movements and pupillometry are frequently referred collectively as oculometrics, which has been developed as a tool to assess the fitness for duty of personnel.

Hypoxia and Mild Traumatic Brain Injury

The present research was motivated in part by a serendipitous observation made during previous research assessing the effects of hypoxia on simulated flight performance (Temme, Still, & Acromite, 2009; Temme, Still, & Acromite, 2010). In that study, 35 Navy, Marine, or Air Force instructor pilots executed a highly demanding flight task in a research grade, desk-top flight simulator while each of the aviator subjects breathed an oxygen partial pressure approximately equivalent to 18,000 feet (ft) (10.5% O_2) for 18 min. Consequently, these subjects were hypoxic in that their blood oxygen concentration was less than the blood oxygen concentration at sea level. While breathing 18,000 ft-equivalent air, the precision of the flight performance deteriorated; however, more germane to the present study is the observation that one pilot was a unique outlier. Specifically, his performance was so variable he lost control of the aircraft, although at sea level he was completely competent and his flight performance was indistinguishable from that of his peers. A subsequent interview with the pilot revealed that he was something of a hero among the group of aviators because he had the unique distinction among his squadron peers of having ejected at high speeds from a jet during a mishap; but during the ejection he lost consciousness. This event occurred more than a year prior to the study. The pilot was completely asymptomatic and returned to flight status long before his participation in this study. This anecdotal case suggested that mTBI effects may persist in individuals who are asymptomatic at sea level. This idea suggests further that at least some of these individuals who are asymptomatic at sea level may evidence reversible mTBI deficits when challenged by hypoxia.

There is an early experiment supporting this hypothesis (Ewing, McCarthy, Gronwall, & Wrightson, 1980). A group of 10 university students who experienced minor head injury 1 to 3 years prior to the study were exposed for 30 min to 3,800 meter (m) (about 12,500 ft) altitude in a low pressure chamber. Ten age and gender matched control subjects with no history of head injury were also exposed to the identical altitude stress. None of the subjects in the experimental group were symptomatic at sea level; however, at altitude, there were clear deficits in short term memory and judgment as reflected by a more lax response bias (likelihood of selecting the same wrong option over other options) in a signal detection task. This detection task permitted the differentiation of response bias from sensitivity (accuracy of responses), which was not affected by the altitude stress. In other words, those with a minor head injury were equally as accurate as the healthy controls; however, when the experimental group made a mistake it was a consistent selection of the same wrong option while the control group's errors were randomly distributed among options. Some effects were apparent within 10 min of altitude exposure. These effects were reversible, disappearing when the subjects were returned to sea level. This early report seems to provide solid support for the ideas underlying this study: individuals with a history of mTBI may be particularly susceptible to the effects of mild or moderate hypoxia and possibly other physiological stressors. It should be noted that civilians as well as military personnel may be exposed to these provocative levels of hypoxia over the course of their normal daily activities.

Hypoxia Exposure in Civilian and Military Aviation

Civilian exposure to hypoxia in aviation.

Hypoxia is a physiological stressor encountered in daily life far more frequently than is commonly realized. Contrary to popular assumptions, United States commercial airline carriers do not pressurize passenger cabins to sea level. Instead, the FAA requires the cabin pressure to be no higher than 8,000 ft above sea level. The National Research Council commissioned two studies involving aspects of commercial flight addressing issues which could adversely impact passenger and crew health and safety (National Research Council, 1986; National Research Council, 2002). Both of these studies concluded that current standards of cabin pressure provide adequate oxygenation for healthy persons, but raised questions for individuals with cardiac, pulmonary, or hematological diseases; the studies did not consider mTBI.

A recent study showed that mean arterial oxygen saturation fell from 97.0% blood oxygen at preflight to 88.6% at altitude during 22 regularly scheduled commercial flights (Cottrell, Lebovitz, Fennel, & Kohn, 1995). These measurements were made in 42 aircrew, not passengers; presumably, the mean arterial oxygen saturation in the passengers would be, if anything, lower since they represent a sample of less homogeneously healthy individuals.

A recent meta-analysis of the available literature developed a set of regression models to predict arterial oxygen in commercial aircraft cabins (Muhm, 2004). The model demonstrated that sea level arterial partial pressure of oxygen (P_aO_2) decreases with age in individuals with normal pulmonary function. More germane to present concerns is the observation that P_aO_2 at sea level predicted P_aO_2 at altitude. This meta-analysis report concluded that "a substantial proportion of passengers may experience moderately severe hypoxia at a cabin altitude of 8,000 ft" (p. 911). The study pointed out:

> …the levels of hypoxia that this study predicts will be manifest between 6,000 and 8,000 ft may be symptomatic. Acute mountain sickness, manifest by headache, nausea, loss of appetite, fatigue, and sleep disturbance – symptoms not uncommon among passengers during or shortly after flight – has been reported within 48 h of arrival at altitudes as low as 6,300 ft (p. 911).

These ideas were evaluated in a recent study of over 500 volunteers participating in an altitude chamber flight lasting 20 hr. During the study, arterial oxygen saturation and acute mountain sickness symptoms were measured at several altitudes using a between-subjects experimental design (Muhm, Rock, McMullin, Jones, Eilers, & McMullen, 2007). At 8,000 ft, mean oxygen saturation decreased about 4.4% from baseline (with a 95% confidence interval [CI] of about 1.0), a change that may not seem meaningful; however, from the published Box and Whisker plots, it is clear that during the 20 hr flight, several of the subjects had oxygen saturations between 80% and 85% during the 20 hr flight. The participation of one (elderly) individual at 8,000 ft was terminated after 5 hr when her oxygen saturation decreased to 78%.

The above studies assessed presumably normal civilian volunteers encountering the atmospheric equivalents to the cabins of commercial airline carriers. Other general aviation environments are more extreme. The Federal Aviation Administration (FAA) permits civilian private pilots to fly at a range of substantially higher altitudes without supplemental oxygen. According to the Federal Aviation Regulations 91.211:

No person may operate a civilian aircraft of U.S. registry –

1. At cabin pressure altitudes above 12,500 ft Mean Sea Level (MSL) up to and including 14,000 ft unless the required aircrew is provided with and uses supplemental oxygen for that part of the flight at those altitudes that is of more than 30 min of duration;

2. At cabin pressure altitudes above 14,000 ft (MSL) unless the required minimum flight crew is provided with and uses supplemental oxygen during the entire flight time at these altitudes; and

3. At cabin pressure altitudes above 15,000 ft (MSL) unless each occupant of the aircraft is provided with supplemental oxygen (Department of Transportation, 2000).

According to these FAA regulations, private civilian pilots and their passengers can have unlimited exposure to 12,500 ft MSL with apparently no anticipated impact on health and no anticipated performance decrement that would jeopardize the pilot's ability to control the aircraft. Furthermore, exposing the required minimum flight crew to 14,000 ft MSL for less than 30 min would not impact health or jeopardize flight control. Civilian passengers who are not considered part of the minimum flight crew can have unlimited exposure up to 15,000 ft MSL. None of these regulations consider the possible impact of altitude-related hypoxic exposure on those with a history of mTBI.

Military exposure to hypoxia in aviation.

Military standards of altitude exposure differ among the Services. The crews of U.S. Army rotary-wing aircraft on operations around the world may be repeatedly exposed to altitude (up to 18,000 ft) and, although these personnel receive periodic hypoxia training, hypoxic events and mishaps do occur (Ramiccio, 1998). The current flight regulation, AR 95-1 (Department of the Army, 2014), lists in section 8-7 the following requirements for flight at altitude:

Approved oxygen systems will be used as follows:

a. Unpressurized Aircraft. Oxygen will be used by aircraft crews and occupants for flights as shown below:

1. Aircraft crews.

   a. On flights above 10,000 ft pressure altitude for more than one hr.

   b. On flights above 12,000 ft pressure altitude for more than 30 min.

2. Aircraft crews and all other occupants.

   a. On flights above 14,000 ft pressure altitude for any period of time.

   b. For flights above 18,000 ft pressure altitude, oxygen prebreathing will be accomplished by aircrew members. Prebreathing may utilize either 100% gaseous aviator's oxygen from a high pressure source, or an onboard oxygen generating system (OBOGS) that supplies at least 90% oxygen in the inspired gas. Prebreathing will be for not less than 30 minutes at ground level and will continue while en route to altitude. In those extraordinary cases where mission requirements dictate rapid ascent, commanders may authorize shorter prebreathing times on a case-by-case basis, with the realization that such practice increases the risk for developing altitude decompression illness. Return to normal oxygen (pressure demand regulator, gaseous oxygen-equipped aircraft) is authorized on descent below 18,000 ft pressure altitude, provided continued flight will not exceed this altitude (Department of the Army, 2014).

The Navy has different regulations, which are contained in OPNAVINST 3710.7T:

> In unpressurized aircraft, the pilot at the controls shall use supplemental oxygen continuously when cabin altitude exceeds 10,000 ft. When oxygen is not available to other occupants, flight between 10,000 and 13,000 ft shall not exceed 3 hr duration, and flight above 13,000 is prohibited (Department of the Navy, 2004).

Specific unpressurized military aircrafts can provide occupant exposures to the altitudes that exceed those named in standards above. The operational environment posed by the Chinook, a nonpressurized Army helicopter with an operating ceiling of up to about 18,500 ft is relevant. Forces may be exposed to hypoxic conditions and the type of supplemental oxygen available depends on the unit and the operations. It may be noted that Army forces transported by the Chinook may have little if any prior experience or formal training concerning the symptoms of hypoxia. The V-22 Osprey, which provides the U.S. Marine Corps and Air Force with the ability to conduct assault support and long-range, high-speed missions requiring vertical take-off and landing capabilities, may pose even more severe challenges since the aircraft's service ceiling is 26,000 ft; and like the Chinook, the cabin is not pressurized. This means that personnel in the cabin are exposed to severe environmental conditions, including the potential for altitude hypoxia (Department of Defense, 2001).

While the Army and Navy regulations and guidance described above provide limits for safe operations of the aircraft, it remains to be seen how these will be implemented when tactical and operational realities of theatre come into play where air speed, fuel, and range considerations may force higher altitude operations. Apparently neither the military nor civilian altitude standards considered the impact of hypoxia on individuals with a history of mTBI, the basic question of the present research.

Methods

Human Subject Volunteers

Two groups of subjects participated in the present study. One group, the experimental group, consisted of individuals with a history of mTBI. The second group, the control group, consisted of individuals with no such history. Each group contained 36 subjects equaling a total of 72 subjects participated in the present study.

The study was performed at Clinvest Research, Springfield, MO, U.S.A., following review and approval by the Chesapeake Institutional Review Board, the U.S. Army Aeromedical Research Laboratory Human Use Committee, and the U.S. Army Medical Research and Materiel Command Human Subjects Research Review Board. The study was conducted in accordance with all Federal laws, regulations, and standards of practice as well as those of the Department of Defense and U.S. Army. The study was determined to pose a greater than minimal risk to the subjects and included several risk mitigation techniques. One such technique was to present the normobaric hypoxic stress conditions in an ascending sequence of severity so that each subject was observed at a lower stress condition before being exposed to a greater stress.

For inclusion into the mTBI group, subjects met the following criteria, which follow closely the criteria of American Congress of Rehabilitation Medicine (McAllister, 2005):

1. a duration of a loss of consciousness of no more than 10 min at the time of the TBI;

2. a duration of post traumatic amnesia of no more than 24 hr;

3. a Glasgow Coma Scale of from 13 to 15 (Kraus & Chu, 2005); and

4. a clinical history consistent with the diagnosis of mTBI.

All volunteers were paid for travel expenses to and from the study site, up to $50 per visit. In addition, an honorarium of $100 was provided for the completion of the data collection session.

The two groups were explicitly matched on the basis of age, gender, and smoking behavior (0 to 9 cigarettes a day and greater than 10 cigarettes a day). Each member of the matched pair of mTBI and control subjects was tested within a week of each other to minimize possible inadvertent differences due to drift in instrumentation or methodology. Appendix A tabulates the age, gender, pulse rate, systolic and diastolic blood pressures, weight, height, and body mass index for each member of the mTBI group. Appendix B tabulates the same information for each member of the control group. Table 2 provides the mean and standard deviation for these parameters (with the exception of gender) for each group. It is noted that each group contained 9 women and 27 men. An analysis of variance showed that the mTBI and control groups did not differ statistically along the dimensions of age, pulse rate, systolic and diastolic blood pressures, respiration rate, weight, height, and body mass index. The probabilities for these comparisons ranged between .817 to .180.

Table 2. Summary of the Characteristics of the Mild Traumatic Brain Injury and Control Groups.

Parameter	Group	*M*	*SD*	*N*
Age (years)	mTBI	25.25	5.416	36
	Control	24.89	4.944	36
	Total	25.07	5.152	72
Pulse (beats/minute)	mTBI	70.81	11.573	36
	Control	72.72	14.232	36
	Total	71.76	12.915	72
Systolic (mmHg)	mTBI	120.14	14.79	36
	Control	120.94	14.617	36
	Total	120.54	14.606	72
Diastolic (mmHg)	mTBI	73.89	9.789	36
	Control	73.36	7.783	36
	Total	73.62	8.784	72
Respiration (breaths/sec)	mTBI	14.17	4.178	36
	Control	16.92	11.453	36
	Total	15.54	8.671	72
Weight (lbs)	mTBI	200.06	64.885	36
	Control	210.99	85.63	36
	Total	205.52	75.633	72
Height (inches)	mTBI	69.5	4.3144	36
	Control	69.944	3.5572	36
	Total	69.722	3.9324	72
Body Mass Index (BMI, m/kg^2)	mTBI	28.325	7.8695	36
	Control	29.736	11.4912	36
	Total	29.031	9.8044	72

Appendix A includes three additional fields containing information pertinent only to the mTBI group: number of months since the trauma, if there was a loss of consciousness (LOC), and if there was post-traumatic amnesia. On average, the concussion occurred 37.8 (*SD* = 33.1) months before participating in the present study, 19 resulted in a LOC, of which; 4 experienced a post-traumatic amnesia.

Experimental Design

The present study was designed to support a between-groups comparison to evaluate the formal null hypothesis that there are no statistically significant differences between these individuals with a history of mTBI and those without such a history along the dimensions defined by the dependent variables. In addition to this between-group comparison, there is a within-group comparison in that the measurements were taken from under five conditions defined by the kind of air the subjects breathed during testing. Specifically, each subject breathed an air and nitrogen (N) mix designed to simulate the partial pressure of oxygen in the air that is encountered at five defined altitudes. The five altitude conditions were presented to every subject in the following sequence: (1) MSL (21% O_2), (2) 8,000 ft above MSL (15.5% O_2 + 84.5% N), (3) 12,000 ft above MSL (14% + 86%), (4) 14,000 ft above MSL (13% + 87%), and (5) MSL. Thus, the experimental design included a within-subject comparison, altitude, of which there were five levels.

Every subject was exposed to a MSL condition twice; once at the beginning and once at the end of the data collection. The MSL condition at the end was to ensure that there were no lingering effects of the hypoxic exposure on the subjects. The exact same altitude sequence was used for all subjects. Consequently, the design we used unavoidably confounded order effects with altitude effects. We chose this strategy for two reasons. First, subject safety; we did not know how individuals with a history of mTBI would respond to this hypoxic stressor. Although some consider the level of hypoxia posed even by a 14,000 ft above MSL altitude to be relatively minor for the normal general population, we thought it prudent to introduce the hypoxic challenge gradually. Secondly, we are more interested in whether any simulated altitude would produce evidence of lingering mTBI effects, rather than the specific impacts of specific altitudes. If such effects did show, then subsequent experimentation could target this second question. Thus, the confounding of order effects was of secondary importance for the purposes of the present study.

This study is a mixed-model experimental design in that it incorporates one between-group factor (experimental vs. control group) and one within-group factor (five levels of altitude). The response dimensions along which these comparisons were made are described below. To statistically evaluate group, altitude, and group by altitude differences two-way analyses of variance, with planned contract follow-up tests, were performed for each dependent variable. Alpha for all tests was held constant at .05. To demonstrate the magnitude of the group difference, effect sizes were determined and reported as r values with the interpretation ranges of .00 to .05 no effect, .10 to .23 small effect, .24 to .33 moderate effect, and greater than .34 large effect. Additionally, correlations among variables were determined (Cohen, 2013). Correlations of interest are presented in the results section and the correlation matrixes for all variables are provided in appendices G and H.

Apparatus

The present study required three pieces of equipment, the Reduced Oxygen Breathing Device (ROBD), the Functional Impairment Tester (FIT), and a hand-held personal digital assistant (PDA). The ROBD was used to induce hypoxia in the volunteers, the FIT recorded oculometrics, and the PDA was used to administer the neurocognitive testing. Of these, only the ROBD and the FIT are discussed here; the PDA is described in a companion report that is in preparation and that will address neurocognitive testing.

Reduced Oxygen Breathing Device.

The ROBD (Environics, Tollande, CT), a commercial, off-the-shelf device, is a portable, computerized, gas-blending instrument that produces normobaric hypoxia, hypoxia without changes in atmospheric pressure. Figure 1 shows the ROBD in the bottom right and the tanked gasses on the left. It uses thermal mass flow controllers (MFC) to mix breathable air and medical nitrogen to produce the equivalent atmospheric oxygen partial pressures for altitudes up to 34,000 ft. The MFCs are calibrated on a primary flow standard traceable to the National Institutes of Standards and Technology. The system is equipped with an emergency dump switch that, if needed, will instantaneously supply to subjects 100% oxygen (Temme et al., 2009; Temme et al., 2010; Sausen, Bower, Stiney, Feigl, Wartman, & Clark, 2003; Sausen et al., 2001).

Several features are built into the ROBD to prevent over pressurization of the mask and to prevent partial pressures of oxygen below those being requested for a particular altitude. Additionally, built-in self-tests verify all system component functionality before the operation of the system can begin. If any self-test fails, the system does not operate. The ROBD also includes a built-in pulse oximeter sensor that can be attached to the subject's index finder or to the earlobe during device use.

Figure 1. The reduced oxygen breathing device and tanked gases used to generate normobaric hypoxia.

The ROBD was developed by the Naval Aerospace Medical Research Laboratory (NAMRL) and is now marketed commercially (Environics, Tollande, CT) for aviation training and for research purposes. The ROBD enables individuals to be safely made hypoxic, without risk of barotrauma and decompression sickness under controlled conditions in such a way that these individuals can engage in the vision and performance-based testing procedures.

Functional Impairment Tester.

The FIT (PMI, Inc, Rockville, MD)is a commercial, off-the-shelf device designed to assess fitness for duty in an objective, quick, and efficient fashion using oculometrics as a sign of neurological changes caused by drugs, alcohol, sleepiness, or other neurological deficits that express themselves in the reflexive ocular motor responses of the eye (Rothberg, Cornsweet, & Rafal, 1995; LeDuc, Greig, & Dumond, 2005a; LeDuc, Greig, & Dumond, 2005b; Cymerman et al., 2003; Cymerman, Muza, Friedlander, Fulco, & Rock, 2005). Figure 2 is an image of the FIT testing apparatus.

Figure 2. Functional impairment tester used to evaluate eye movements.

Dependent Variables and Response Measurements

The present report limits its discussion to the data derived from the ROBD, FIT, and the subject's subjective reports of the hypoxic symptoms. The companion report in preparation addresses the impact of hypoxia on the cognitive functions.

Reduced Oxygen Breathing Device.

The ROBD includes a pulse oximeter, which provides a display readout of the volunteer's pulse rate in beats per minute and percent hemoglobin oxygen concentration (SpO_2). These values were recorded by hand every minute during altitude exposures.

Functional Impairment Tester.

The FIT software automatically records pupil diameter in the dark, the latency of the pupil's response to a flash of light, the amplitude of that response, which is the difference between the diameter in the dark and the diameter in the light, and the saccadic velocity of the eye moving between a pair of alternately flashing lights. These four measurements are made one after the other, without any break and represent a complete trial requiring about 1 min to complete. The FIT makes these measurements using image analysis algorithms of reflections from the eye's optical surfaces. Completing these four measurements requires careful cooperation of the volunteer so that sometimes the trial is aborted or incomplete in that not all four measurements were successfully made. The FIT database contained every trial, even the trials that were incomplete. Consequently, the FIT dataset includes a measure of the number of completed and incomplete trials as well as the specific oculometrics.

Subjective reports of hypoxic symptoms.

The subjective reports were measured using a paper and pencil questionnaire that assessed the level of agreement of the following statements:

1. I felt light headed.
2. I had a headache.
3. I felt dizzy.
4. I felt faint.
5. My vision was dim.
6. My coordination was off.
7. I felt weak.
8. I felt sick to my stomach (nauseous).
9. I lost my appetite.
10. I felt sick.
11. I felt hung-over.

For each of these brief simple declarative statements, the volunteer reported the extent to which the statement was accurate using the 6-point Likert rating scale with the options: 0 (*not at all*), 1 (*slight*), 2 (*somewhat*), 3 (*moderate*), 4 (*quite a bit*), 5 (*extreme*).

These response items were drawn from the literature reporting a standardized questionnaire developed to assess the symptoms associated with Environmental Stress Questionnaire (ESQ) (Muhm et al., 2007; Sampson, Cymerman, Burse, Maher, & Rock, 2005). This standardized questionnaire originally contained 68 items. The responses to this 68-item questionnaire were factor analyzed producing the following set of nine factors.

- Acute mountain sickness – cerebral (AMS – C): symptoms appear to reflect altered cerebral or cerebellar functioning in conjunction with malaise.

- Acute mountain sickness – respiratory (AMS – R): symptoms apparently indicate shortness of breath, and other mask issues.

- Ear, nose, and throat discomfort.

- Cold stress reflects the symptoms of cold feet, cold hands.

- A relatively generalized distress that includes mood as well.

- Alertness reflecting positive affective arousal states rather than factor 9, fatigue.

- Exertion stress, which was evident in those volunteers who were exercising during these studies.

- Muscular discomfort, a factor which reflects residual muscle fatigue from exercise.

- Fatigue, symptoms loading here are tired, sleepy, weak, faint, etc.

The 11 items that were used in the questionnaire for the present study were the items that comprised the AMS – C and the items reflecting cerebral and cerebellar issues. Of course, since the items used in the present study are isolated from the full questionnaire, we do not consider the responses to the 11 items recorded in the present study as a measure of the AMS – C factor that would be measured with the complete 68 item questionnaire.

In summary, the database we report includes the two measures from the ROBD (pulse rate and SpO_2), the four measures from the FIT (pupil diameter, pupil response latency, pupil response amplitude, saccadic velocity), including the number of incomplete FIT trials, the 11 subjective ESQ AMS – C responses, as well as the individual volunteer's physical parameters tabulated in Appendices A and B and summarized in Table 2.

Procedures

Subject recruitment flyers were placed in several locations throughout the local community where people with a history of head injury would likely see them. These locations included academic athletic departments, bicycle shops, fitness and health centers as well as such clubs and organizations as roller derby teams, rodeo clubs, rugby teams, ice hockey teams, and rock climbing groups. The posted announcements provided contact phone numbers.

During initial phone screening, the study and the inclusion criteria for participation were described. Specific additional exclusion criteria included pregnancy; history of drug or alcohol abuse; depression; bipolar disorder; schizophrenia; problems with the heart, kidney, or liver; asthma; strokes; mini-stroke; poor leg circulation; any ongoing medical problems; current or past neurological problems such as seizures, epilepsy or dementia; post-traumatic headache; current concentration and/or memory problems because of the head injury; LOC greater than 10 min at time of injury; and post-traumatic amnesia greater than 24 hr at time of injury.

For prospective mTBI subjects, appointments were arranged as soon as convenient following the phone screening. For prospective control subjects, names, demographics and contact information were filed so that these prospective subjects could be matched appropriately with mTBI subjects on the basis of age, gender, and smoking behavior.

After an appointment was scheduled, prospective subjects were told how much they would be compensated for their participation in the study; they were also asked to bring documentation of their injury for the study records, if appropriate. Also, if the prospective subjects wore contact lenses, the individual was told to wear glasses on the day of testing. The individual was told to abstain from any alcohol 12 hr before testing. A copy of the informed consent document (ICD) was mailed or e-mailed to the individual so the prospective subjects could review it at their convenience beforehand.

When the prospective subject arrived for testing, a hardcopy of the previously mailed ICD was provided. The consenting individual went through the ICD with the prospective subject. The consenting individual described the study in detail and answered any questions the prospective subject had in order to ensure that the individual understood all aspects of the experimental procedures and was fully informed and completely comfortable with all procedures. The prospective subject read the ICD, initialed the bottom of each page, and signed the document at the end. All procedures were documented with an ICD checklist. All subjects were given a copy of the ICD for their own records.

After the ICD was signed, a study intake form was completed, which documented such information as sitting blood pressure, heart rate, respiration, height, and weight. The inclusion/exclusion criteria were again reviewed to ensure consistency with the study. Female subjects provided a urine sample to test for pregnancy. The study physician reviewed this information and examined the subject to ensure compliance with all inclusion/exclusion criteria and that the individual was medically qualified to participate in the study. The physician also asked questions of the subject to ensure that the subject understood all procedures and to determine whether the subject had any history of altitude sickness or wheezing. Once the study physician was sure that the subject was healthy and qualified to participate, the physician signed the intake forms.

The subject was then introduced to the testing facility, including the test apparatus. The technician described the FIT and completed five trials with it to ensure the subject understood how it worked. If it took more than 10 attempts for the subject to complete five trials, the technician realigned the subject in the FIT and repeated the measurements.

The first three of these five FIT warm-up trials were completed without the subject being connected to the ROBD. For the last two FIT warm-up trials, the technician fitted the subject’s finger with the pulse oximeter. The technician also fitted the ROBD mask (Gentex HyperMed Oxygen Mask) on the subject’s face to introduce the individual to the task of making the FIT measurements with the mask. It may be noted there were four different sizes of masks from which the correct size mask was selected based on the size of the subject’s face.

Once the mask was securely attached to the face, the technician had the subject close off both of the valves in the mask (one for inhalation and one for exhalation) to ensure that there was no leakage. If there was leakage or if the mask did not fit tightly or was uncomfortable, adjustments were made to fit the mask securely. On occasion a different size mask was substituted. The fifth and last FIT warm-up trial was conducted with the ROBD turned on but not connected to the mask so that the subject would know what noises to expect during testing. During these steps any questions the subject had about the ROBD and FIT were answered.

Once the subject was comfortable with the FIT, cognitive testing was introduced. During this familiarization process, the subject wore the mask and the pulse oximeter finger sensor so that the subject would become accustomed to them. After the subject reported being comfortable with all the testing procedures, the subject was encouraged to take a break before formal testing began.

Subjects were instructed to breathe normally and were watched to ensure that they did breathe normally to guard against hypocapnia. Every subject went through the same sequence of altitudes: MSL, 8,000 ft, 12,000 ft, 14,000 ft and MSL again. At the beginning of each altitude, the volunteer acclimated to that altitude for 1 min before beginning the following sequence of testing: (1) FIT test; (2) cognitive testing, results reported elsewhere; (3) ESQ subjective questionnaire; and (4) a second FIT test.

When this testing sequence was completed, the subject was returned to MSL and asked whether s/he wanted to take off the mask and take a break. If the subject opted for a break, the mask was removed and the airflow through the ROBD was turned off. When the subject was ready to continue, ROBD airflow was begun and the subject donned the mask and checked to make sure the seal was tight. If the subject opted to continue testing without a break, the volunteer rested at MSL for at least 1 minute before exposure to the next altitude. This procedure was repeated for each of the five altitudes.

After the subject completed the five altitudes, s/he removed the mask and remained under observation in the laboratory for at least 30 min to ensure that there were no signs of any after effects of the hypoxic exposures.

Results

Duration of Normobaric Hypoxic Exposures

The duration of the altitude (i.e., normobaric hypoxic exposures for each subject) was determined ultimately by the time each subject needed to complete the scheduled measurements at that altitude. Table 3 presents the average time, in minutes, needed to complete the measurements at each of the five altitude conditions for each of the two groups of subjects and for all subjects combined. Note that MSL-1 refers to the measurements made at sea level at the beginning of the data collection and MSL-2 refers to the measurements made at sea level at the end of the data collection. The column named *Total* refers to the duration of the whole data collection session, which included any rest breaks between tested altitudes, so that the total durations all are longer than the sum of the durations of the five altitudes.

Table 3. Mean Time (min) to Complete Measurements at Each Altitude Condition

Group	**Altitude**					**Total**
	MSL-1	**8,000 ft**	**12,000**	**14,000**	**MSL-2**	
mTBI	**14.11**	**13.7**	**14.2**	**13.9**	**13.9**	**84.7**
Control	**13.86**	**14.5**	**14.2**	**13.4**	**13.6**	**83.1**
Mean	**13.9**	**14.1**	**14.2**	**13.7**	**13.8**	**83.9**

Note. The times in the *Total* column refer to the total duration of the data collection session, including rests and breaks between altitudes.

A mixed model analysis of variance (ANOVA) showed no significant differences among these durations. Thus, times needed to complete the measurements for each of the five altitude conditions were not significantly different nor were there significant differences between the two groups of subjects, and none of the interaction terms were significant. Consequently, the exposure times for the two groups were not statistically different.

Reduced Oxygen Breathing Device Measurements

The ROBD produced two measures, SpO_2 and pulse rate. Appendix C tabulates these measurements for each of the mTBI subjects at each of the five altitudes and Appendix D tabulates these measurements for each of the control subjects at each of the five altitudes.

Pulse oximetry: Percent blood oxygen

The SpO_2 for each altitude is presented in Table 4 separately for the mTBI and the control subjects. An ANOVA showed that the two groups of subjects differed significantly in their SpO_2, $F(1,70) = 13.247$, $p < .001$. With an $r = .399$, the effect size is conventionally considered to be moderate.

As expected, there was a main effect of altitude on SpO_2, $F(1.639,114.762) = 702.133$, $p < .001$, which, with an $r = .9271$, is quite large. More importantly, there was a significant interaction between group and altitude. Specifically, since Mauchly's test indicated that the main effect of altitude violated the assumption of sphericity ($\chi^2 = 299.616$, $p < .001$), the degrees of freedom (*df*) for the interaction ANOVA were corrected using Greenhouse-Geisser estimates ($\varepsilon = .410$) to produce $F(1.639,114.762) = 9.087$, $p < .001$, with an $r = .709$, a value generally taken to indicate a large effect. Contrasts were performed to examine further this interaction. Contrasts showed there were no statistical differences between the mTBI and control subjects at MSL-1 and MSL-2; however, with respect to the MSL-2 condition, the SpO_2 response of the mTBI subjects differed from the SpO_2 response of the control subjects at 8,000 ft ($p < .004$), $r = .333$; 12,000 ft ($p < .001$), $r = .403$; and 14,000 ft ($p < .003$), $r = .341$. The respective r values show these differences to be of moderate statistical size. These comparisons are illustrated in Figure 3, which includes the 95% CI around the average SpO_2 for the mTBI and control groups.

Table 4. Mean Percent Hemoglobin Oxygen Concentration at Each Altitude Condition

Group	Altitude				
	MSL-1	8,000 ft	12,000	14,000	MSL-2
mTBI	97.05	93.58	88.49	85.12	97.09
Control	96.92	92.53	85.72	82.22	96.94
Mean	96.99	93.06	87.11	83.67	97.03

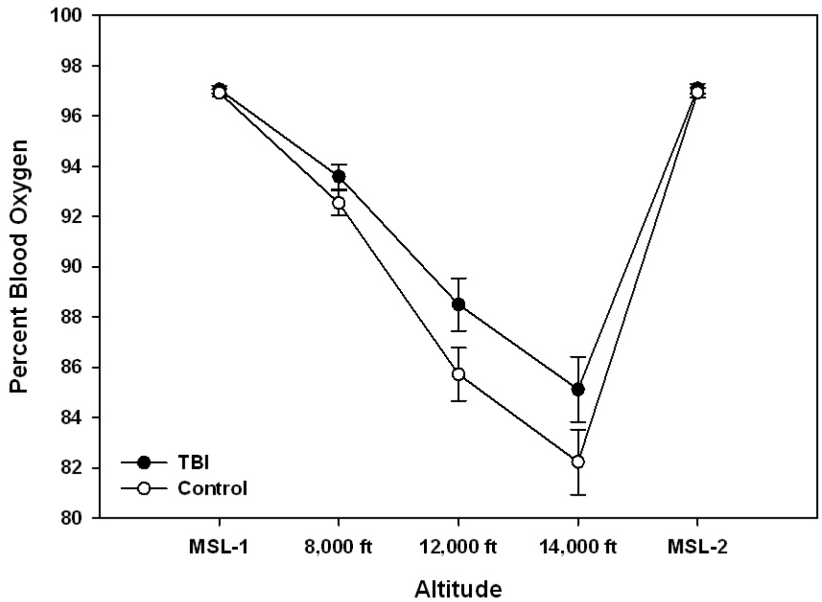

Figure 3. Average percent hemoglobin oxygen concentration as a function of the altitude condition for the mild traumatic brain injury (closed circles) and control (open circles). Error bars show the ±95% CI.

Correlations

Since each individual was exposed to five different altitude conditions; it is possible to question the extent to which the SpO_2 at one altitude predicts the SpO_2 at the other altitudes. To address this question, the Pearson product moment correlations of the SpO_2 measurements made at each of the five altitudes were correlated with each other. With five altitudes, there are ten possible altitude pairs and therefore ten correlations. This correlation matrix was calculated for the mTBI subjects and is presented in Table 5, while the matrix calculated for the control subjects is presented in Table 6.

Table 5. Pearson Product Moment Correlation Matrix of Percent Hemoglobin Oxygen Concentration for the Mild Traumatic Brain Injury Group at Each Altitude Condition (n = 36).

		MSL-1	8,000 ft MSL	12,000 ft MSL	14,000 ft MSL	MSL-2
MSL-1	**Pearson Correlation**	**1**	**0.671**	**0.506**	**0.265**	**0.554**
	Significance		**0.000**	**0.002**	**0.119**	**0.000**
8,000 ft MSL	**Pearson Correlation**		**1**	**0.845**	**0.685**	**0.563**
	Significance			**0.000**	**0.000**	**0.000**
12,000 ft MSL	**Pearson Correlation**			**1**	**0.859**	**0.347**
	Significance				**0.000**	**0.038**
14,000 ft MSL	**Pearson Correlation**				**1**	**0.182**
	Significance					**0.233**
MSL-2	**Pearson Correlation**					**1**
	Significance					

The matrices in Tables 5 and 6 can be used to compare further the responses of the two groups of subjects. Two of the correlations in Table 5 were not statistically significant (14,000 ft with the MSL-1 or with MSL-2) whereas four of the correlations in Table 6 were not statistically significant (MSL-1 and MSL-2 with 12,000 ft and with 14,000 ft). Furthermore, the average correlation for the mTBI group was .547 (SD = .230) and the average correlation for the control group was .433 (SD = .198), a difference that was statistically significant by t-test ($p < .001$) evaluation. These differences suggest that the SpO_2 under one altitude condition was more predictive of the SpO_2 under other altitude conditions for the mTBI subjects than for the control subjects. It may be noted further that there were only two correlations in Table 5 that were smaller than the corresponding correlations in Table 6. One of these correlations was the MSL-2 with 14,000 ft, which was not significant in either matrix. The other one of these two correlations was between MSL-1 with MSL-2.

Table 6. Pearson Product Moment Correlation Matrix of Percent Hemoglobin Oxygen Concentration for Control Group at Each Altitude Condition (n = 36).

		MSL-1	8,000 ft MSL	12,000 ft MSL	14,000 ft MSL	MSL-2
MSL-1	**Pearson Correlation**	1	0.480	0.211	0.154	0.580
	Significance		0.003	0.216	0.369	0.000
8,000 ft MSL	**Pearson Correlation**		1	0.618	0.651	0.440
	Significance			0.000	0.000	0.007
12,000 ft MSL	**Pearson Correlation**			1	0.668	0.322
	Significance				0.000	0.055
14,000 ft MSL	**Pearson Correlation**				1	0.204
	Significance					0.233
MSL-2	**Pearson Correlation**					1
	Significance					

Pulse rate

The average pulse rate in beats per minute (bpm) for each altitude is presented in Table 7 separately for the mTBI and the control subjects. These data are also shown in Figure 4, which includes the 95% CI around the average pulse rate for the mTBI and control groups. An ANOVA showed that the overall average pulse rate response of the mTBI (74.732 bpm) and the control subjects (78.77 bpm) did not differ statistically, $F(1,70) = 2.417$, $p < .125$. On the other hand, the five different altitude conditions did affect overall average pulse rate response, $F(2.323,162.584) = 142.519$, $p < .001$, but more importantly, the different altitude conditions had different effects on the pulse rate responses of the mTBI and the control subjects, an interaction effect that was examined in further detail. Specifically, since Mauchly's test indicated that the main effect of altitude violated the assumption of sphericity ($\chi^2 = 110.013$, $p < .001$), the *df* for the interaction ANOVA were corrected using Greenhouse-Geisser estimates ($\varepsilon = .581$) to produce an $F(2.323,162.584) = 3.752$, $p < .020$, with an $r = .150$, which indicated a significant but relatively modest interaction effect.

Table 7. Mean Pulse Rate of the Two Groups of Subjects Measured at Each Altitude Condition.

Group	Altitude				
	MSL-1	8,000 ft	12,000 ft	14000 ft	MSL-2
mTBI	73.72	75.6	77.11	78.04	69.18
Control	76.6	79.74	82.46	83.38	71.66
Mean	75.16	77.67	79.78	80.71	70.42

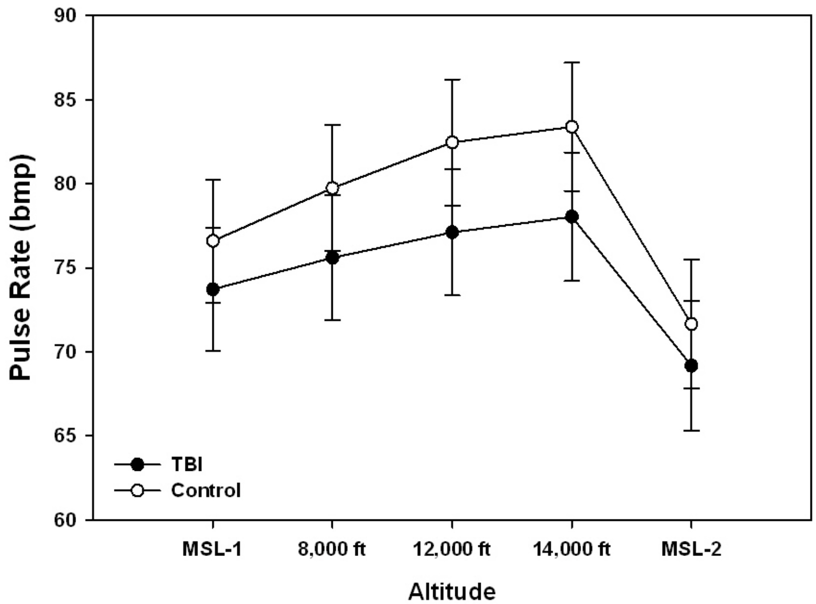

Figure 4. Mean pulse rate as a function of altitude for the mTBI (closed circles) and control (open circles). Error bars show the ±95% CI.

To examine further this interaction, contrasts were calculated comparing the pulse rate of the mTBI and control groups at different altitude, see Table 7. These contrasts showed that while there were statistically significant differences in pulse rate between the MSL-1 (75.16 bpm) and MSL-2 (70.42 bpm), $F(1,70) = 124.945$, $p < .001$, the difference between the mTBI and control subjects at MSL-1 (2.88 bpm) and MSL-2 (2.48 bpm) was not significant, $F(1,70) = .209$, $p < .649$. Similarly, the difference between the mTBI and control subjects at 8,000 ft (4.14 bpm) and MSL-2 (2.48 bpm) was not significant, $F(1,70) = 2.974$, $p < .089$. The situation was different at the 12,000 ft and 14,000 ft altitudes. The difference in pulse rate between the mTBI and control subjects at the 12,000 ft (5.35 bpm) and at MSL-2 (2.48 bpm) was significant, $F(1,70) = 5.381$, $p < .023$, $r = .267$ as was the difference between the groups at 14,000 ft, (5.43 bpm), $F(1,70) = 6.102$, $p < .016$, $r = .283$. Effect sizes were in the moderate range.

Correlations

Since each individual was exposed to five different altitude conditions; it is possible to question the extent to which pulse rate at one altitude predicts the pulse rate at the other altitudes. To address this question, the Pearson product moment correlations of the pulse rate measurements made at each of the five altitudes were correlated with each other. With five altitudes, there are 10 possible altitude pairs and therefore 10 correlations. This correlation matrix was calculated for the mTBI group; and is presented in Table 8 while the matrix calculated for the control subjects is presented in Table 9.

Together, the matrix in Tables 8 and 9 can be used to compare further the responses of the two groups of subjects. All ten correlations calculated for both the mTBI and the control subjects (tables 8 and 9, respectively) were significant. The average of these ten correlations for the group of mTBI subjects was .932 (*SD* = .034). The average of these 10 correlations for the control subjects was .934 (*SD* = .028). There was no evidence of any systematic or statistically significant patterns of differences in correlations of Tables 8 and 9 as there was in Tables 5 and 6.

Table 8. Pearson Product Moment Correlation Matrix of Pulse Rate for Mild Traumatic Brain Injury Group at Each Altitude Condition (*n* = 36).

		MSL-1	8,000 ft MSL	12,000 ft MSL	14,000 ft MSL	MSL-2
MSL-1	Pearson Correlation	1	0.974	0.899	0.892	0.957
	Significance		0.000	0.000	0.000	0.000
8,000 ft MSL	Pearson Correlation		1	0.943	0.935	0.944
	Significance			0.000	0.000	0.000
12,000 ft MSL	Pearson Correlation			1	0.981	0.892
	Significance				0.000	0.000
14,000 ft MSL	Pearson Correlation				1	0.899
	Significance					0.000
MSL-2	Pearson Correlation					1
	Significance					

Table 9. Pearson Product Moment Correlation Matrix of Pulse Rate for Control Group at Each Altitude Condition (n = 36).

		MSL-1	8,000 ft MSL	12,000 ft MSL	14,000 ft MSL	MSL-2
MSL-1	Pearson Correlation	1	0.963	0.916	0.894	0.947
	Significance		0.000	0.000	0.000	0.000
8,000 ft MSL	Pearson Correlation		1	0.971	0.942	0.933
	Significance			0.000	0.000	0.000
12,000 ft MSL	Pearson Correlation			1	0.967	0.899
	Significance				0.000	0.000
14,000 ft MSL	Pearson Correlation				1	0.915
	Significance					0.000
MSL-2	Pearson Correlation					1
	Significance					

Oculometrics, Functional Impairment Tester Measurements

The FIT device measured ocular motility along four dimensions: pupil diameter, pupil response latency, pupil response amplitude, and saccadic velocity. These four oculometrics were recorded for each subject under each of the altitude conditions. Appendix E presents these oculometric measurements from the individual subjects in the mTBI group and Appendix F presents these oculometric measurements from the individual subjects in the control group for each of the five different altitude conditions. The means of the mTBI and the control group responses for the four response parameters over the five altitude conditions are listed in Table 10.

Table 10. Mean Responses of the Mild Traumatic Brain Injury and the Control Subjects for Each of the Four Oculometric Response Parameters at Each Altitude Condition.

Response Parameter	Group	Altitude				
		MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
Pupil Diameter	mTBI	5.425	5.289	5.171	5.083	5.189
	Control	5.873	5.681	5.589	5.433	5.665
	Mean	5.642	5.471	5.373	5.523	5.419
Pupil Response Amplitude	mTBI	1.134	1.126	1.094	1.062	1.113
	Control	1.194	1.143	1.109	1.063	1.159
	Mean	1.163	1.134	1.102	1.062	1.135
Pupil Latency	mTBI	299.98	298.28	301.27	299.85	303.02
	Control	294.23	293.71	295.24	293.57	294.44
	Mean	297.19	296.07	298.35	296.81	298.87
Saccadic Velocity	mTBI	74.25	72.47	72.96	72.06	71.67
	Control	72.32	73.64	71.99	71.01	71.02
	Mean	73.31	73.04	72.49	71.55	71.36

Multivariate statistical analysis showed that hypoxic stress significantly affected the oculometric responses, (Pillai's Trace, V = 0.636, $F(16,59) = 5.123$, $p < .001$); however there was no statistically significant evidence that the hypoxic stress affected the oculometric responses of the mTBI group differently than the control group (Pillai's Trace, V = 0.107, $F(4,59) = 1.761$, $p < .149$) nor was there any statistically significant evidence of an interaction between the two groups of volunteers and the hypoxic stress (Pillai's Trace, V = 0.270, $F(16,47) = 1.088$, $p < .392$). Consequently, for the statistical analysis of the effects of the hypoxic stress on the different oculometric responses, the responses of the two groups of volunteers are combined.

For these comparisons, Mauchly's test indicated that the assumption of sphericity was violated for pupil diameter ($\chi^2 = 30.850$, $df = 9$, $p < .001$), pupil response amplitude ($\chi^2 = 22.876$, df = 9, p < .001), and saccadic velocity ($\chi^2 = 17.053$, $df = 9$, $p < .048$), so Greenhouse-Geisser *df* corrections of 0.800, 0.847, and 0.886, respectively, were used for the univariate evaluation these response parameters. It should be noted that Mauchly's test showed no statistical evidence that pupil response latency violated the assumption of sphericity ($\chi^2 = 14.892$, $df = 9$, $p < .094$) so no Greenhouse-Geisser correction was used for evaluating the pupil response latency.

Hypoxic stress affected pupil diameter, $F(3.201, 198.4810) = 22.145$, $p < .001$, pupil response amplitude, $F(3.388, 210.028) = 10.134$, $p < .001$, and saccadic velocity, $F(3.544, 219.723) = 4.929$, $p < .001$; however, there was no evidence that the hypoxic stress altered the latency of the pupil response, $F(3.565, 221.006) = 1.291$, $p < .276$. Contrasts were calculated for pupil diameter, pupil response amplitude, and saccadic velocity in order to identify the hypoxic stress comparisons that were responsible for the significant differences. All contrasts were calculated with respect to the MSL-2 condition.

Concerning pupil diameter, the MSL-2 pupil diameter was 5.419 millimeters (mm), which was significantly smaller than the 5.642 mm pupil diameter measured at MSL-1, $F(1,62) = 20.620$, $p < .001$, but the MSL-2 pupil diameter of 5.419 mm was significantly larger than the 5.253 mm diameter pupil measured at 14,000 ft MSL, $F(1,62) = 13.564$, $p < .001$. The pupil diameters measured at the two other hypoxic stress conditions were not different from the MSL-2 comparison. These differences can be seen in Figure 5, which separately plots average pupil diameter and the 95% CI calculated for the mTBI and the control groups for each of the five altitude conditions. Although there are no statistically significant differences between the two subject groups, showing them separately in Figure 5 is informative, illustrating a statistically insignificant but consistent difference between the groups that may be worth further investigation.

Concerning pupil response amplitude, the MSL-2 amplitude was 1.135 mm, which was significantly larger than the 1.102 mm response amplitude measured 12,000 ft MSL, $F(1,62) = 4.578$, $p < .036$, as well as the 1.062 mm pupil response amplitude measured at 14,000 ft MSL, $F(1,62) = 19.086$, $p < .001$. The pupil response amplitudes measured at the other two hypoxic stress conditions were not different from the MSL-2 comparison. These differences can be seen in Figure 6, which plots average pupil response amplitude and the 95% CI calculated for the mTBI and the control groups separately for each of the five altitude conditions. Although there were no statistically significant differences between the two subject groups, showing them separately in Figure 6 is informative, possibly suggestive of a systematic albeit small and statistically insignificant difference between the groups that may be worth further investigation.

Concerning pupil response latency, as mentioned earlier, there were no statistical justifications for pursuing additional statistical comparisons, yet the data in Figure 7, plotting average pupil response latency and the 95% CI calculated for the mTBI and the control groups separately for each of the five altitude conditions are intriguing. Although there are no statistically significant differences between the two subject groups, showing them separately in Figure 7 is informative, illustrating a statistically insignificant but consistent difference between the groups that may be worth further investigation, a pattern consistent with the data in Figure 5.

Concerning saccadic velocity, the MSL-2 velocity was 71.36 degrees per second (deg/sec), which was significantly slower than the velocities of: 73.31 deg/sec recorded at the MSL-1, $F(1,62) = 8.539$, $p < .005$, and the 73.04 deg/sec velocity recorded at 8,000 ft MSL, $F(1,62) = 7.570$, $p < .008$. Neither the 72.49 deg/sec nor the 71.55 deg/sec velocities recorded respectively at 12,000 ft MSL, $F(1,62) = 3.756$, $p < .057$ and 14,000 ft MSL, $F(1,62) = 0.102$, $p < .751$, differed from the velocity recorded at MSL-2. The average saccadic velocity and the 95%

CI calculated for the mTBI and the control groups are plotted separately in Figure 8, which plots average pupil response amplitude, and the 95% CI calculated for the mTBI and the control groups separately for each of the five altitude conditions. Although there are no statistically significant differences between the two subject groups, the graph is informative; by itself, it shows little evidence for any consistent pattern of differences between the subject groups.

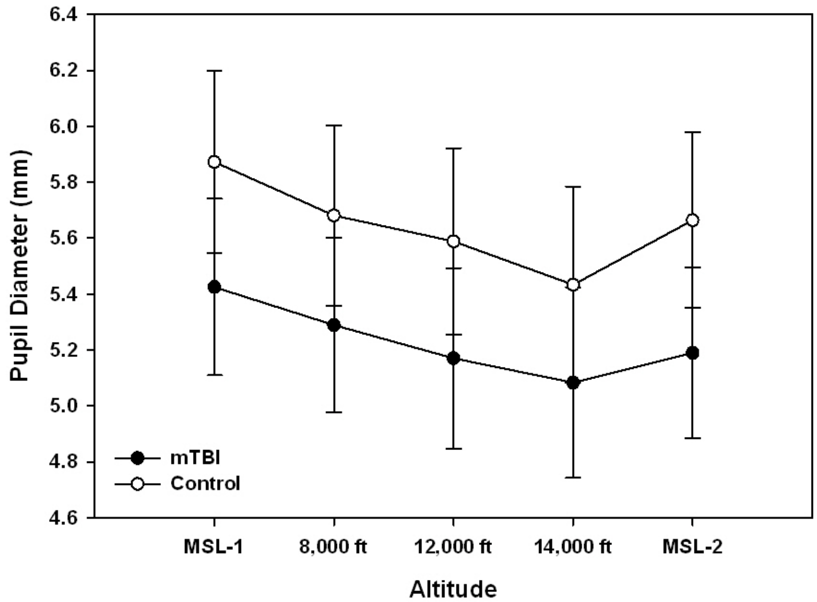

Figure 5. Pupil diameter as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects (closed circles) and for the group of control subjects (open circles). The error bars show the ±95% CI.

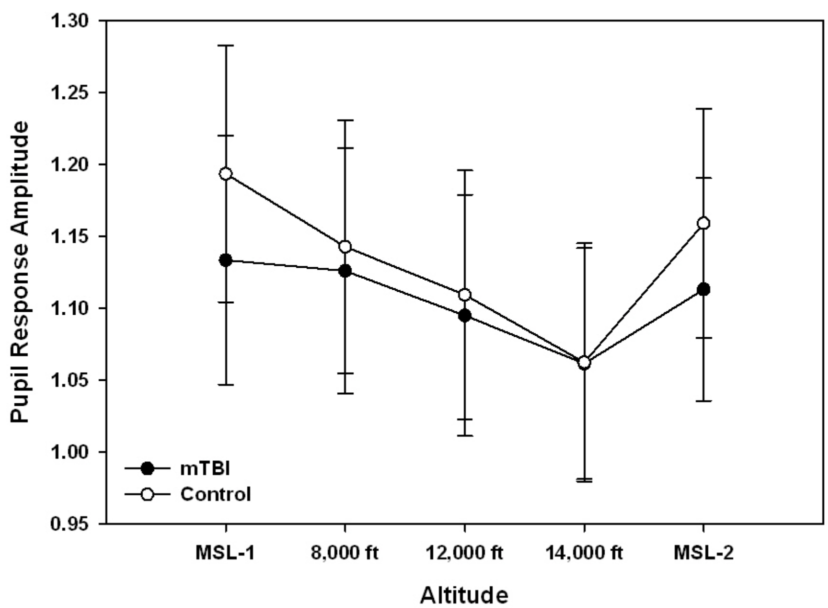

Figure 6. Pupil response amplitude as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects (closed circles) and for the group of control subjects (open circles). The error bars show the ±95% CI.

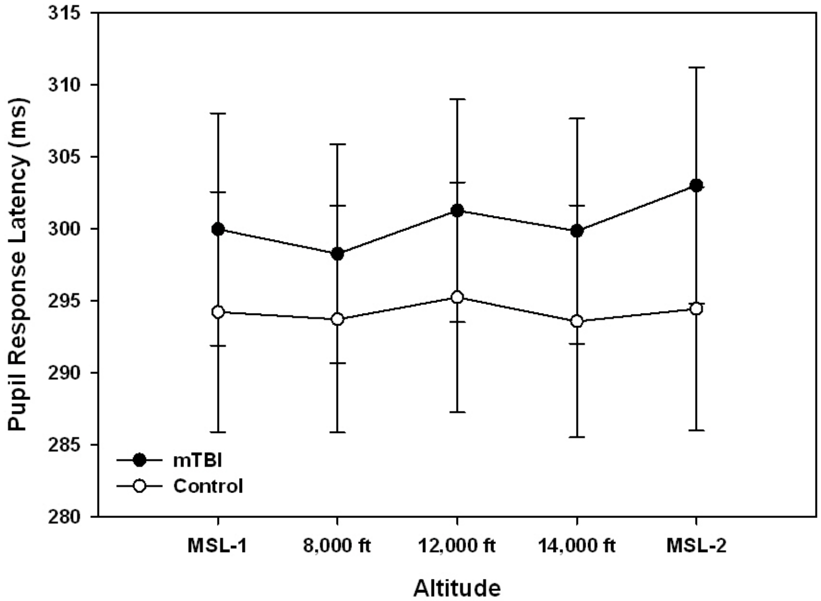

Figure 7. Pupil response latency as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects (closed circles) and for the group of control subjects (open circles). The error bars show the ±95% CI.

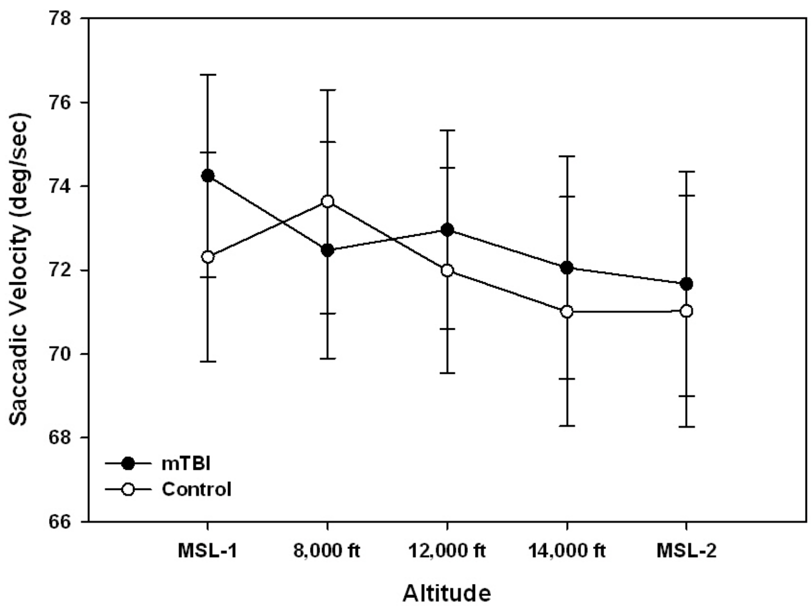

Figure 8. Saccadic velocity as a function of hypoxic condition averaged for the group of mild traumatic brain injury subjects (closed circles) and for the group of control subjects (open circles). The error bars show the ±95% CI.

Environmental Stress Questionnaire: Acute Mountain Sickness-Cognitive

The results of the Environmental Stress Questionnaire: Acute Mountain Sickness-Cognitive (ESQ AMS-C) self-report are presented in Table 11, which tabulates the sum of the rating for each question for each of the five altitudes separately for the two groups of subjects. The sum of ratings was established by adding all Likert scale response values together; for example, if one subject reported a 3 (*somewhat*), another a 2 (*moderate*), and the rest reported 0 (*not at all*), the sum value would be 5. Scores per item could range from 0 to 180 (36 subjects by 5 *extreme*). These ESQ AMS-C data are displayed in Figure 9, which shows for the mTBI and the control groups the sum of the ESQ AMS-C responses as a function of altitude.

Table 11. Environmental Stress Questionnaire: Acute Mountain Sickness-Cognitive Sum of the Ratings for Each Question Item for the Mild Traumatic Brain Injury and Control Groups Over Each Altitude Condition.

ESQ Question	MSL-1		8,000 ft		12,000 ft		14,000 ft		MSL-2		Total	
	mTBI	Control	mTBI	Control	mTBI	Control	mTBI	Control	mTBI	Control	mTBI	Control
I felt light headed	5	5	10	11	19	18	32	29	6	15	72	78
I had a headache	2	2	6	7	10	13	16	13	12	13	46	48
I felt dizzy	2	0	6	3	9	9	18	19	1	7	36	38
I felt faint	1	2	7	5	10	13	18	17	4	5	40	42
My vision was dim	4	3	9	6	14	7	22	10	3	5	52	31
My coordination was off	9	8	20	10	29	14	42	23	12	8	112	63
I felt weak	2	4	5	4	12	7	22	10	3	4	44	29
I felt sick to my stomach (nauseous)	0	0	4	0	6	2	6	2	1	1	17	5
I lost my appetite	0	0	1	0	1	0	1	0	0	0	3	0
I felt sick	0	0	1	0	2	2	4	2	0	1	7	5
I felt hung-over.	0	0	1	0	1	1	5	3	0	1	7	5
Total	25	24	70	46	113	86	186	128	42	60	436	344

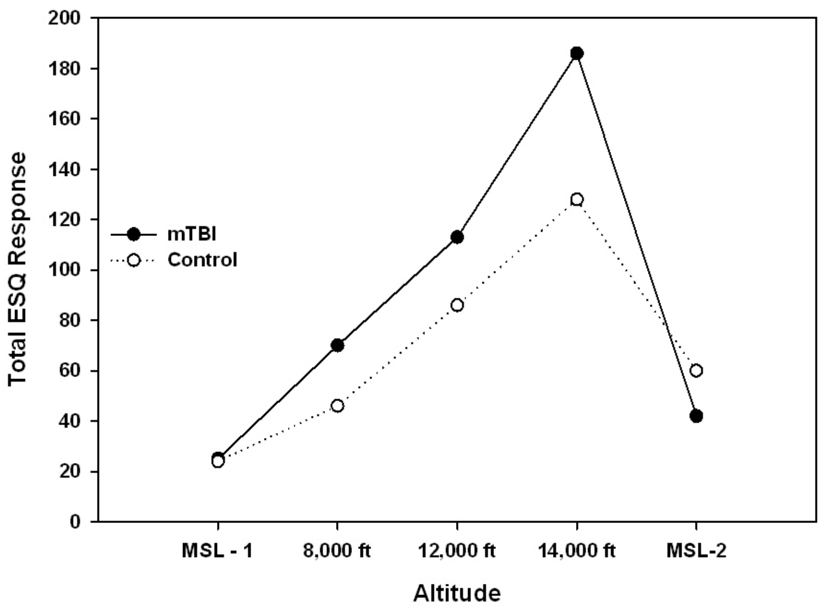

Figure 9. Environmental Stress Questionnaire responses recorded for the two groups of subjects (mild traumatic brain injury and control) separately as a function of altitude condition. Note that the ordinate is the sum over the 11 ESQ items for the specific group for the altitude indicated on the abscissa.

These effects were evaluated using a three-factor, mixed model ANOVA with one between-subject variable and two within-subject repeated measure variables. The one between subject variable was the group to which the subject belonged, either the mTBI or control group. One within-subject repeated measures variable was altitude, of which there were five levels (MSL-1, 8,000 ft, 12,000 ft, 14,000 ft, and MSL-2). The other within-subject repeated measures variable was ESQ question, of which there were 11 levels, where each level was one of the ESQ questions. As mentioned, the response was the subject's Likert scale self-report of the magnitude of the symptom.

Mauchly's test indicated that both within-subject variables violated the assumption of sphericity (altitude, χ^2 (9) = 129.65, p < .001, ε = .579; and ESQ, χ^2 (54) = 503.989, p < .001, ε = .579). The results showed that the responses were significantly affected by altitude, V = .439, F(4,65) = 12.702, p < 001; ESQ, V = .604, F(10,59) = 8.988, p < 001; and the interaction of altitude with ESQ, V = .712, F(38,31) = 2.016, p < 024. The between-subject variable, group, was not significant, F(1,68) = .592, p < .444, nor was the interaction of group with altitude, ESQ, or the altitude by ESQ interaction.

Tests of within-subject contrasts compared the altitudes with respect to MSL-2 and showed that MSL-1, F(1,68) = 7.002, p < .01, r = .306; 12,000 ft, F(1,68) = 13.325, p < .001, r = .405; and 14,000 ft, F(1,68) = 37.398, p < .001, r = .596, each differed from the MSL-2 reference. The significant difference between MSL-1 and MSL-2 indicates that lingering hypoxic sensations were experienced immediately after the conclusion of the three hypoxic stress conditions. The time necessary for these sensations to fully dissipate is worth exploring in future investigations.

While the statistical interactions of altitude with the ESQ question item are extremely complex and lengthy to describe, the last column of Table 11 suggests some generalities that illustrate the significant finds that did emerge. Specifically, the subjective report of the effect of hypoxia on coordination was most severe followed by feeling light-headed, headache, feeling faint, dizziness, a dimness of vision, and weakness. There were negligible reports of feeling sick to the stomach (nervous), a loss of appetite, sick, or hung-over.

Overall correlation among variables

All variables were entered into a single correlation matrix for the mTBI group (Appendix G) and for the control group (Appendix H). These two exploratory analyses were conducted to identify meaningful relationships between variables. It was anticipated that inter-variable correlations would reveal consistent trends between demographic variables and dependent variables and that these trends would be maintained across the levels of the independent variable. However, meaningful relationships did not emerge beyond those reported throughout this results section. These matrixes do contain relationships that would be expected for all human subjects. For example, systolic and diastolic blood pressures were correlated with BMI and pulse rate for both groups; but none of these variables were consistently associated with FIT or ESQ measures in either group.

Discussion

The specific research goal of the present study was to evaluate the possibility that mTBI may have lingering effects that are not evident unless the individual is confronted with stressful situations or challenges that could have a greater than normal effect on the individual with mTBI. More specifically, individuals with a history of mTBI who appear asymptomatic under normal environmental conditions may have lingering or hidden deficits or other consequences of mTBI that only become apparent when confronting environmental or physiological stressors that may be relatively minor and routinely encountered by military personnel or by civilians during their daily activities. This possibility would suggest that mTBI could have covert or occult (not accompanied by readily discernable signs or symptoms) affects that may not be evident unless the individual is compromised in some further way. This notion was formalized for experimental evaluation by formulating the null hypothesis that no statistically significant differences in selected measures would be found between a sample of individuals with a history of mTBI, who appeared asymptomatic under sea level conditions, and a sample of individuals without such a history, the mTBI and the control groups, when the two groups were stressed by normobaric hypoxia. Normobaric hypoxia is a prototypical physiological stress for this type of research paradigm. While the volunteers were exposed to three moderate levels of the hypoxia stress conditions, four general response categories were measured:

a. Pulse oximetry, which included percent blood oxygen saturation, (SpO_2) and pulse rate (bpm);

b. Oculometric (FIT measures), which included measurements of the size of the eye's pupil at rest, the pupil's response latency, the pupil's response amplitude, and the eye's saccadic velocity;

c. The subjective, self-reported (ESQ AMS-C) severity of symptoms associated with normobaric hypoxic stressor as rated along 11 response dimensions; and

d. Neurocognitive assessment, to be discussed in a separate report.

The experiment incorporated a design that exposed the mTBI and control volunteers to three different levels of the normobaric hypoxic stress using the ROBD that manipulated the concentration of oxygen in the air breathed by the research volunteers and two control conditions in which oxygen concentration was not manipulated. Five oxygen concentrations (and corresponding PO_2 values) are most easily indexed to altitude in that the magnitude of the hypoxic stress was defined as the PO_2 typically encountered at defined altitudes (Gradwell, 2006). The specific altitude equivalents were: (1) Sea level at the start of the study, which imposed no increment in stress whatsoever for any of the volunteers and is referred to as MSL-1; (2) 8,000 ft MSL, which may be considered to impose a very imposed a low stress, (3) 12,000 ft MSL, which may be considered to impose a moderate stress; (4) 14,000 ft MSL, which may be considered to impose a moderately high stress; and (5) Sea level at the completion of the study, which is referred to as MSL-2 and is a condition used to ensure that the volunteer did not display any lingering effects from the preceding hypoxic exposures. Thus, there were five altitude conditions in the study and all subjects experienced all altitudes so that the study was designed to compare the responses of the two groups of subjects (mTBI vs. controls) across the five altitude conditions. This experimental design is typically referred to as a mixed design since it incorporates between-group (mTBI vs. controls) as well as within-group comparisons (across the hypoxic/altitude conditions) (Field, 2009).

The mTBI and controls were matched for gender, age, resting pulse rate, systolic and diastolic blood pressures, resting respiration rate, weight, and height to reduce the likelihood that these variables or factors associated with them might predispose one or the other group to the effects of normobaric hypoxia, thereby confusing the experimental results. Height and weight were used to estimate BMI. A simple between-subject multiple analysis of variance (MANOVA) showed that the mTBI and control groups did not differ significantly along any of these dimensions. Each control subject was tested within a week of the mTBI subject to which the control subject was paired, ensuring that any systematic but inadvertent drifts in instrumentation and/or experimental procedures would have essentially simultaneous and therefore equivalent impact on both the mTBI and control groups.

The present report documents the results of this study, excluding discussion of the neurocognitive results, which are presented in a companion report. The present report provides summary statistics and comparisons of the two study groups, while providing a first order analysis of the major findings derived from all subjects of the two groups.

As expected, the hypoxic stress had significant effects on arterial oxygen saturation recorded with the pulse oximeter such that the greater the hypoxia (i.e., the higher the altitude or equivalently, the lower the partial pressure of oxygen) the less the arterial oxygen saturation. Thus the physiological stress, hypoxia, had a strong effect on SpO_2. More surprising, however, was the unanticipated discovery of a difference in SpO_2 between the mTBI and the control subjects. Specifically, while the SpO_2 of the mTBI and control groups was indistinguishable at MSL-1 and at MSL-2, at altitudes of 8,000, 12,000, and 14,000 ft MSL not only was the SpO_2 of the mTBI group significantly higher than the SpO_2 of the control group, but the greater the hypoxia, the greater the difference in SpO_2. These completely unanticipated differential effects of the altitude on the SpO_2 of the mTBI group and the control group were of a moderate statistical size.

The effects of decreasing PO_2 (increasing altitude) were reflected systematically in the pulse rate that was recorded simultaneously with SpO_2. Hypoxia affected pulse rate in that the greater the hypoxia (i.e., the lower the PO_2 or equivalently, the higher the altitude), the higher the pulse rate. It should be noted that the pulse rate recorded at MSL-1 was statistically significantly greater than the pulse rate recorded at MSL-2 whereas there was no such statistically significant difference in SpO_2 between these two conditions. This would seem to indicate that at the conclusion of the hypoxic condition, the pulse rate was lower than at the start of the study and may simply reflect the relief the subjects experienced that the stressful situation had come to an end. A comprehensive literature review did not identify descriptive information of this depressed pulse rate response to breathing sea level oxygenated (normal air) immediately following short duration exposures to hypoxia.

The pulse rate showed an unanticipated finding that was consistent with the unanticipated finding of the SpO_2 data, the pulse rate of the mTBI group was statistically significantly less than the pulse rate for the control group at the two greatest hypoxic stress levels. In summary, there was strong evidence that the hypoxic stress affected both the pulse rate and the SpO_2 of the control (normal) subjects more than both the pulse rate and SpO_2 of the mTBI subjects, a very surprising and counterintuitive finding.

There was another difference that should be noted between the mTBI and control subjects' SpO2 and pulse rate response to hypoxic stress. Specifically, this was the difference between the mTBI and the control subjects' pattern of correlations over altitude among SpO_2 and among pulse rate. In effect the difference was reflected in the size of the correlation coefficient calculated among the different hypoxic stress levels for the mTBI subjects and for the control subjects separately for SpO_2 and for pulse rate. The pattern was clear, those subjects who had a high pulse rate for one stress level had a high pulse rate for another stress level. Conversely, those with a low pulse rate for one stress level had a low pulse rate for another stress level so that the correlation coefficients provide a measure of the relative consistency of the response across subjects. The same was true for the SpO_2 response: those with a high SpO_2 for one hypoxic stress tended to have a high SpO_2 under another hypoxic stress and so forth. A statistically significant difference was apparent between the mTBI and control subjects in the pattern of correlations such that the correlations are statistically significantly stronger for the mTBI subjects than for the control subjects. In other words, there was more consistency among the mTBI subjects than there was among the control subjects.

None of these differences between the two groups was expected, and to a great extent they seem counterintuitive. One possible explanation is that they simply reflect a random error (i.e., a false positive); an explanation that seems unlikely in light of the size the effect, the probability levels involved, and the care that was exercised in matching the two groups of volunteers along a number of apparently relevant physical parameters. Another possible explanation concerns the nature of the two groups of volunteers. It is possible that the mTBI volunteers tended to be more physically active than are the control volunteers. In fact it may be argued that the extent of physical activity was a risk factor for mTBI in that these individuals regularly engaged in physically demanding activities more frequently than did the control volunteers. This could mean that the mTBI group would have been more physically fit that the control group, which could account for the fact that as a group, the mTBI volunteers had lower heart rates and higher SpO_2 when confronted with the hypoxic stress conditions; a difference completely consistent with being more physically fit. This would mean that the effort to control for such predisposing factors by matching along the dimensions of smoking history, age, gender, weight, and height was insufficient to overcome the other effects of physical conditions for the analyses reported here.

Another possibility is that the difference between the two groups does reflect a systematic difference resulting from the trauma history. For example, it is known that exercise is associated with the contraction of the spleen and the release of substantial quantities of red blood cells into the circulation resulting in an increased oxygen transport capacity. It has recently been demonstrated that the type of hypoxic stress used in the present study is similarly associated with the contraction of the spleen and the release of substantial quantities of red blood cells into the blood stream within minutes of exposure to hypoxia, a time course that is relevant to the present study (Lodin-Sundstrom & Schagatay, 2010). The stimulus mechanisms signaling this response in the human body have yet to be fully demonstrated, but current evidence suggests more of a hormonal basis than a strictly neural innovation. Regardless of the stimulus mechanisms controlling this response, it is possible that the trauma history might impact the release of red blood cells or similar mechanisms that control the vascular system.

One of the aspects of the difference between the mTBI and control volunteers was the implication that the higher SpO_2 and lower heart rate of the mTBI group would seem to imply the group was healthier or the cardiovascular system more fit. On the other hand, since heart rate and SpO_2 were recorded using a finger pulse oximeter, they reflect only the peripheral circulation and do not reflect any local differences in cerebral circulation. There are many local mechanisms that control the distribution of blood and oxygen throughout the body, with particular emphasis on ensuring that the supply of oxygen to the brain is stable. Thus, a peripheral pulse oximeter at the finger, which can easily be influenced by peripheral vasoconstriction, anemia, hypotension, etc., may not only be a poor indicator of the cerebral oxygenation, but a misleading one. It is possible that if the circulatory system was functioning accurately, ensuring that oxygen would be preferentially delivered to the brain, one would expect the peripheral oximetry measured at the finger to drop. The present results could be completely consistent with this idea, in that the greater SpO_2 of the mTBI group might indicate a failure of the system to adjust correctly; a failure that could be due to any of a large number of mechanisms, ranging from local capillary control through pH regulation to changes in receptor dynamics. This idea is consistent with the intuitive expectation that the trauma would decrease rather than an increase a physiological capability.

The hypoxic stress had a statistically significant effect on the oculometric responses but without any evidence of a difference between the mTBI and control volunteers, a finding that seems to contradict the underlying hypothesis of the presence of lingering, covert, or occult effects of mTBI in otherwise asymptomatic individuals. It should be emphasized that the oculometric battery chosen here is extremely rudimentary, and while it was quickly administered and available with commercial off-the-shelf instrumentation, with the expectation that essentially all the volunteers would be able to complete testing, there was no expectation the battery provides anything but a very rudimentary oculometric assessment. The negative results found here do not provide any guarantee that the oculo-motor system of these individuals was necessarily normal. For example, there was no assessment of smooth pursuit tracking of the eyes, conjugate eye movements, accommodation, or the interconnection among accommodation, convergence, and pupillary constriction. It may be that this study's most important contribution concerning the use of hypoxic stress for the evaluation of oculometrics in mTBI is that the procedures were well tolerated by all the volunteers, and more sophisticated assessment of oculometrics is worth exploring before concluding that oculometric measures are not sensitive to mTBI and control differences when exposed to hypoxic stress.

Pupil diameter was altered by hypoxia. The magnitude of this effect was evaluated with respect to the MSL-2 condition, which was the condition of breathing sea level oxygen at the completion of the study after being exposed to all four of the other conditions: the MSL-1 condition and the three hypoxic conditions simulating 8,000 ft, 12,000, and 14,000 ft MSL. It may be noted that the comparisons with MSL-2 were simply a statistical expediency; the comparison with MSL-1 led to the same conclusions, in several instances with greater significance. Pupillary diameter decreased with increased hypoxia, although the difference was statistically significant between MSL-2 and the 12,000 ft and the 14,000 ft MSL conditions it was not at the 8,000 ft condition. While the change in pupil diameter due to hypoxia was statistically significant, the magnitude of the effect was quite small, as can be seen from Table 10. The pupil diameter measured at MSL-2 was 5.419 mm, while the pupil diameter measured at

14,000 ft MSL was 5.523 mm, a difference of 0.104 mm, which was less than a 4% decrease in pupil area. While the pupil and pupil diameter are important factors affecting characteristics of the optical imagine forming on the retina, this small change in pupil area in all probability has essentially no impact on the retinal image; as far as the image on the retina is concerned, the effect is completely unimportant. On the other hand, the more important aspect of this finding may lie in the suggestion that the change in pupil diameter reflect a change in the balance between the sympathetic and parasympathetic systems due to hypoxia. It may be noted that the literature on the pupil's response to hypoxia, reviewed in 1988 by Dyer (Dyer, 1988), contains conflicting reports showing that hypoxia can increase, decrease, or have no effect on pupil diameter, differences that may be due as much to with the specifics of the experimental procedures as to the fact that the pupil's response to hypoxia seems to be so small.

Similarly, the results showed a systematic decrease in the amplitude of the pupil's response to a flash of light as a function of hypoxia. At 12,000 ft MSL the 1.102 mm response to light was about 94.3% of the area measured at MSL-2, and the area at 14,000 ft MSL was 87.6%. It may be noted that the latency of the pupil's response was unaffected by hypoxia. Since the autonomic nervous system clearly can have large effects on the pupil's diameter, response amplitude, and response latency, it is only to be expected that emotion, arousal, anxiety, etc. would impact these oculometrics. For example, the difference in the measurements made under MSL-1 and MSL-2 could well reflect the fact the MSL-1 condition incorporates any emotional component arising from the imminent hypoxic stress while the MSL-2 condition incorporates the emotional component associated with the completion of hypoxic stress conditions and the near completion of the study period.

There was some evidence that hypoxia systematically reduced saccadic velocity, since the velocities measured for the 12,000 ft, 14,000 ft, and MSL-2 conditions were not different from each other but the MSL-2 velocity was significantly slower than the MSL-1 condition. The *t*-test comparison of the saccadic velocity at MSL-1 with 8,000 ft MSL was not statistically significant ($t = .584$, $p < .561$) but the MSL-1 was significantly faster than the velocity measured at 12,000 ($t = 2.05$, $p < .044$), 14,000 ft MSL ($t = 3.233$, $p < .002$), and at MSL-2 ($t = 3.088$, $p < .003$). While the MSL-2 condition might have incorporated hypoxia effects that may have accumulated over the successive altitude exposures, the finding of a decrease in saccadic velocity is consistent with the literature (Cymerman et al., 2005).

Analysis failed to show a significant difference between the groups of mTBI and control volunteers in their responses to the ESQ AMS-C, the self-report questionnaire of physical symptoms associated with hypoxia. Although the differences between the mTBI and control groups were not statistically significant, the mTBI group had a greater symptom rating than did the control volunteers for 8,000, 12,000, and 14,000 ft MSL (Table 11 and Figure 9). This negative finding shows that the hypoxia was well tolerated by the subjects. The time course relationship between time since trauma, magnitude of trauma, and physical symptoms associated with hypoxia is currently unavailable in the literature, and future work should use sound scientific methods to provide descriptive responses.

The relation between symptom severity and hypoxic condition was explored further. Since there were no statistically significant differences between the two groups of volunteers, the symptom ratings for the two groups shown in Table 11 were combined as follows. In each of the two groups, there were 36 individuals and each individual rated the 11 questionnaire items on a scale with a maximum value of 5, so that for a group, at an altitude, the maximum rating for a questionnaire item was 180; specifically, the product of the maximum rating (5) and the number of subjects in the group (36). The 11 ratings for the mTBI group were summed separately from the 11 ratings of the control group at each altitude. Thus, at an altitude, there were 11 ratings for each group so that combining the two groups entailed averaging the 22 ratings for each hypoxic condition, to produce an average symptom ($\pm$SEM) rating for each altitude, as shown in Figure 10. Simple *t*-tests compared the mean symptom severity scores across the five hypoxic conditions and showed that the mean symptom ratings were statistically different with the exception of the ratings at 8,000 ft MSL and the MSL-2 conditions. While there was no hypoxic stress posed under MSL-1, the symptoms were appreciably different from zero, suggesting a form of tonic or background level of symptom to which the hypoxic effects were added or compounded. Also, the magnitude of the symptoms reported during the MSL-2 condition were significantly greater than MSL-1 and in fact were statistically indistinguishable ($t = 0.834$, $df = 21$, $p < .414$) from the magnitude of the symptoms reported during the 8,000 ft MSL exposure, suggesting the continued effects of the previous hypoxic exposures. With the exclusion of the MSL-2 condition, the symptoms increased with increasing hypoxic stress.

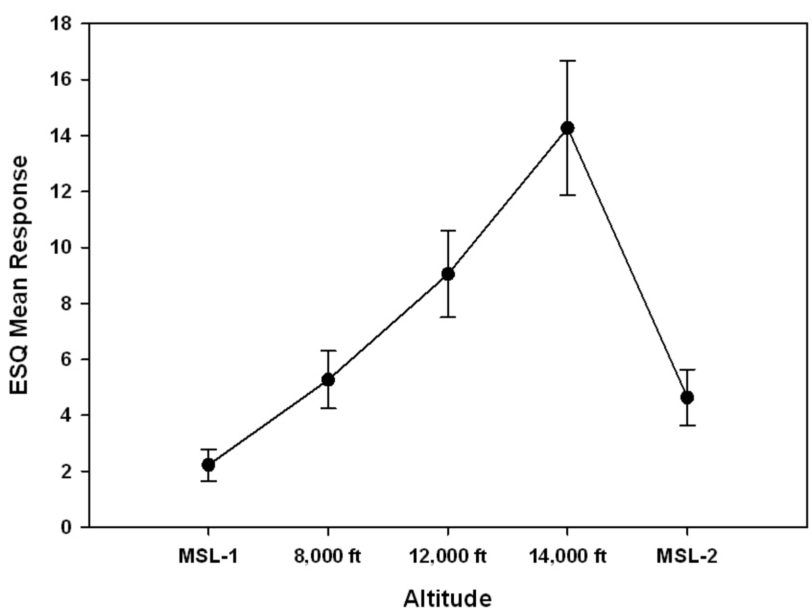

Figure 10. Average ($\pm$ Standard Error of the Mean) Environmental Stress Questionnaire responses as a function of hypoxic condition. The average was calculated by summing over the 11 question items for both the mild traumatic brain injury and control groups for each altitude.

A sense of the relative severity of these symptoms may be gained by considering the method by which the rating scores were summarized. The maximum rating possible at each altitude was the product of 11 items rated 5 by 72 volunteers, or 3960. The average response ratings in Figure 10 were all a fraction of the maximum possible; the 14,000 ft MSL rating, which was the largest, was less than 0.4% of the maximum. Thus, in general, the data suggest that the severity of the hypoxic symptoms reported by the volunteers was extremely small.

On the other hand as mentioned in association with the symptom severity summarized in Table 11, the 11 ESQ AMS-C items do seem to show differences in response severity to hypoxia even though all the 11 items were selected to reflect the symptoms that defined the cerebral factor of Acute Mountain Sickness. In general, the 11 questionnaire items may be grouped into three general classes based on the relative ranking of the total symptom severity, granting that the magnitude of the symptoms were slight. Summing over all 72 volunteers over the five altitude conditions with a maximum severity of 5 produced a maximum possible symptom rating of 1800. The different symptoms can be compared to this maximum value. The slightest symptoms involved a loss of appetite (0.167 % of maximum), a feeling of hangover (0.667%), a feeling of sickness (0.667%), and feeling nauseous (1.222%). The slightly more severe symptoms involved feeling weak (4.056%), feeling dizzy (4.111%), feeling faint (4.556%), having dim vision (4.611%), having a headache (5.222%). The most severe symptoms involved feeling light headed (8.333%) and reporting that the coordination was off (9.722%). Thus it would seem that even though symptom severity was quite modest in general, there was evidence that the hypoxic stress had a spectrum of effects with the most severe affecting coordination and light headedness. It would be important to extend the analysis of the present dataset to examine the relationships among symptom severity, oculometrics, and pulse oximetry.

Conclusion

The present analysis is intended to provide a description and summary of the complete dataset for the study described above. While it provides a description of the main trends of the complete dataset, it is not intended to be an exhaustive treatment of the data analysis; consequently, it does not take into account a number of other factors that can reasonably be expected to affect the results and that need to be examined before definitive conclusions are drawn from these data. For example, the most obvious such factor concerns the range in the length of time between the trauma and volunteer's test participation, an interval that ranges from 1.7 to 119.7 months. In addition, attention should be paid to physical conditioning indices such as BMI, blood pressures, and more careful consideration of the magnitude of the hypoxic responses.

In summary, the results showed that SpO_2 and pulse rate responses differed between individuals with a history of mTBI who were asymptomatic at the time of the study and matched healthy controls when exposed to the normobaric hypoxic stress conditions equivalent to 8,000, 12,000, and 14,000 ft MSL. FIT measures and subject measures (ESQ AMS-C) showed responses to the within subjects variable of hypoxia level but did not show significant differences between the two groups. Overall, this set of findings did not fully support all *a priori* hypotheses and moreover the SpO_2 and pulse rate responses were counter intuitive in that they were expected to be depressed in the mTBI group compared to controls but were found to be elevated above the control group values.

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Appendix A. Mild Traumatic Brain Injury Group Description.

Subject Number	Gender	Age	Pulse	BP Systolic	BP Diastolic	Respiration	Weight (lbs)	Height (in)	BMI	Months Since Trauma	LOC	Amnesia
1101	M	24	43	111	63	12	190	70.5	27.3	23.6	1	0
1102	M	20	60	117	67	20	164	71.5	22.9	16.7	0	0
1103	F	21	75	108	74	12	124	61	22	18.0	0	0
1104	M	23	69	108	67	16	162	68	24	20.1	1	0
1105	F	20	83	122	81	16	145	68	21	19.1	1	0
1106	M	29	80	110	70	16	349	71	48.7	17.2	0	0
1107	F	26	79	120	80	10	116	63	21	25.0	0	0
1109	M	20	52	127	52	9	210	71	30	105.8	1	0
1111	M	20	54	111	56	8	176	74	22	33.8	0	0
1112	M	24	72	126	80	6	172	69	25	34.9	1	0
1113	M	26	64	127	87	11	238	73	31	76.6	1	0
1114	M	20	70	122	79	12	162	72	22	17.8	1	0
1116	M	19	56	86	49	12	142	70	20	23.9	1	0
1117	M	29	96	125	80	12	315	72	42	1.7	1	0
1118	M	38	79	149	84	20	267	72	36.2	15.0	1	1
1119	M	30	76	135	79	16	327	79	36.8	7.9	0	0
1120	M	32	86	145	90	16	279	76	34	63.8	1	1
1121	F	21	68	111	76	10	129	66	20	7.4	1	1
1122	M	33	71	125	86	24	193	67	30	13.2	0	0
1123	F	29	63	105	73	16	255	64	43.8	119.7	0	0
1124	F	21	80	100	69	12	140	64	24	17.3	0	0
1125	M	36	79	105	69	20	153	68	23	55.9	0	0
1126	M	18	76	130	76	20	165	70	23	14.5	0	0
1127	M	21	74	108	65	12	134	70	19	29.0	0	0
1129	F	20	72	106	73	12	204	68	31	76.4	1	0
1130	M	26	77	148	90	15	364	71	48	109.9	0	0
1132	F	24	62	105	64	12	154	66	25	51.2	1	0
1133	M	25	69	137	83	10	199	69	29	16.7	0	0
1134	M	26	73	124	79	15	233	69	34	66.6	1	0
1135	M	33	72	114	81	20	208	59	31	34.2	1	1
1136	M	35	59	107	65	12	146	68	22	106.2	1	0
1137	M	22	52	120	74	20	171	76	21	35.3	0	0
1138	M	27	86	144	70	12	194	71	27	8.0	0	0
1139	M	24	57	124	78	12	204	74	26	62.8	1	0
1140	F	18	78	119	71	20	159	65	26	7.1	0	0
1141	M	29	87	144	80	12	259	76	31	7.8	1	0

Note. BMI = Body Mass Index; BP = Blood Pressure LOC = Loss of Consciousness, 1 = Yes, 0 = No; Amnesia, 1 = Yes, 0 = No; Respiration in breaths per minute

Appendix B. Control Group Description.

Subject Number	Gender	Age	Pulse	BP Systolic	BP Diastolic	Respiration	Weight (lbs)	Height (in)	BMI
1201	M	24	59	119	82	12	211	75	26.4
1202	M	21	71	130	75	16	211	76.5	26
1203	F	22	59	101	69	18	135.4	68	21
1204	M	24	76	108	64	14	142.4	64.5	24
1205	F	20	76	106	65	8	142	71.5	20
1206	M	28	61	116	80	14	164	72	22
1207	F	23	83	110	74	12	156	65.5	24
1209	M	20	69	137	81	12	202	72	27
1211	M	20	54	134	85	12	191	69	28
1212	M	20	93	103	65	20	203	73	26
1213	M	27	86	118	66	12	157	75	20
1215	M	19	63	108	66	10	127	70	18
1216	M	18	73	130	78	15	388	73	51.2
1217	M	30	95	138	93	20	455	67	71.3
1218	M	34	91	122	76	20	199	71	27.8
1219	M	32	73	132	78	16	194	70	28
1220	M	30	77	148	88	16	517	70	31
1221	F	21	95	104	71	20	129	66	21
1222	M	33	90	125	79	10	189	71	26
1223	F	28	84	101	69	20	250	63	44
1224	F	21	69	102	70	20	156	64	26.8
1225	M	34	74	143	86	8	239	63	60
1226	M	21	69	121	68	20	238	71	33
1227	M	20	69	115	60	80	212	77	25
1229	F	23	81	105	65	20	140	68	21
1231	M	23	52	114	63	12	186	68	28
1232	F	25	85	129	77	12	266	68	40
1233	M	27	70	126	71	14	143	71	20
1234	M	27	66	138	68	12	208	72	29
1235	M	32	65	110	76	12	150	71	21
1236	M	33	69	116	70	14	204	73	27
1237	M	20	45	128	71	16	174	70	25
1238	M	27	56	125	72	20	268	74	34
1239	M	23	51	121	70	16	200	70	29
1240	F	18	62	109	68	16	173	68	26
1241	M	28	107	162	82	20	276	67	43

Note. BP = Blood pressure mmHg; BMI = Body Mass Index; Respiration in breaths per minute

Appendix C. Percent Hemoglobin Oxygen Concentration and Pulse Rate for Each Mild Traumatic Brain Injury Subject at Each Altitude Condition.

Subject	Percent Blood Oxygen					Pulse Rate (beats per minute)				
Number	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
1101	97.00	94.69	91.58	87.00	97.75	51.08	48.92	50.50	55.38	50.63
1102	96.82	94.90	89.00	84.30	97.60	71.55	75.00	76.10	75.90	63.10
1103	97.58	93.70	88.60	83.50	97.50	61.33	67.30	67.10	70.70	59.00
1104	96.67	92.50	86.08	80.94	97.00	73.80	74.17	78.00	79.38	65.00
1105	97.80	94.69	91.46	89.00	97.46	79.67	82.46	79.38	82.55	76.54
1106	97.25	93.91	89.31	85.36	96.17	86.00	88.73	91.77	92.36	82.92
1107	97.23	94.73	90.82	85.25	96.64	70.31	73.45	75.00	76.75	71.91
1109	97.33	95.45	92.27	91.45	96.60	56.33	56.09	54.27	52.73	50.90
1111	96.91	93.70	87.91	84.73	97.40	59.55	60.90	65.55	65.00	57.20
1112	96.94	92.92	88.23	82.75	97.75	74.25	75.08	75.46	80.00	71.33
1113	96.67	93.62	90.18	89.44	97.21	73.61	76.62	81.82	82.61	71.00
1114	97.50	93.55	86.00	81.64	97.55	82.08	81.00	81.36	84.18	78.82
1116	96.85	89.50	81.75	74.27	96.58	59.54	61.29	66.63	67.36	54.42
1117	97.23	93.54	87.36	82.67	97.00	98.92	97.54	99.29	99.33	95.42
1118	96.57	91.00	86.18	83.45	96.09	77.14	77.36	81.55	80.45	74.64
1119	97.23	94.08	89.93	88.00	97.43	75.46	79.00	79.13	79.00	72.14
1120	96.56	91.55	86.83	83.92	95.45	86.19	91.82	96.17	94.17	81.36
1121	97.33	94.09	86.83	83.91	97.73	72.50	75.09	77.92	79.82	68.55
1122	97.09	94.45	91.60	93.64	97.10	72.91	73.82	72.30	70.45	69.40
1123	96.77	94.67	88.73	86.45	97.45	70.00	76.67	82.82	82.27	70.82
1124	96.86	93.46	85.57	83.46	97.23	80.71	78.69	73.00	73.08	70.00
1125	95.67	89.67	83.92	81.27	96.31	78.00	81.00	82.33	82.91	72.15
1126	96.92	93.17	88.82	88.18	96.92	85.08	85.75	83.00	83.27	81.00
1127	97.33	94.15	89.69	87.08	98.09	74.87	75.92	73.08	70.85	67.64
1129	97.92	93.91	89.55	84.08	97.91	68.25	70.27	75.45	76.83	66.91
1130	97.42	94.30	87.91	84.18	97.45	86.50	88.50	89.36	92.45	81.91
1132	97.55	95.09	88.45	83.27	97.55	68.73	69.45	72.18	75.27	67.45
1133	97.27	92.45	86.73	82.92	96.93	71.09	77.91	73.55	77.50	63.71
1134	97.08	92.64	87.00	82.92	96.00	78.08	79.73	85.42	88.15	69.45
1135	96.14	91.85	84.50	79.50	96.67	73.29	76.23	82.50	84.08	67.75
1136	96.85	95.45	94.75	93.45	96.75	67.38	67.73	66.67	67.55	58.92
1137	97.83	96.91	91.73	90.18	97.73	63.33	68.73	75.64	73.27	58.00
1138	96.38	92.77	86.92	84.92	96.77	68.94	69.15	75.50	74.46	60.62
1139	97.38	95.45	91.91	84.67	97.09	69.77	70.27	68.91	69.17	61.27
1140	97.43	94.60	91.75	87.00	98.00	77.21	78.13	75.17	78.23	74.10
1141	96.46	91.91	85.93	85.50	96.33	90.77	91.91	92.21	91.92	84.42

Appendix D. Percent Oxygen Percent Hemoglobin Oxygen Concentration and Pulse Rate for Each Control Subject at Each Altitude Condition.

Subject	Percent Blood Oxygen					Pulse Rate (beats per minute)				
Number	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
1202	97.00	94.00	88.83	87.00	97.00	74.77	75.18	74.42	72.62	67.75
1203	97.45	92.92	79.82	80.10	96.91	66.09	68.25	72.09	75.30	62.18
1204	97.09	93.31	84.09	81.45	97.10	69.27	73.00	76.91	77.00	61.00
1205	96.91	92.55	85.73	82.18	97.27	78.27	82.36	88.91	88.27	73.45
1206	97.20	92.93	88.38	84.80	97.15	72.67	69.20	72.56	71.40	63.15
1207	97.15	93.13	89.77	84.08	97.60	87.23	88.47	88.15	94.33	89.30
1209	97.75	93.45	87.82	82.45	97.73	86.92	88.27	90.45	100.91	84.73
1211	97.15	93.23	88.58	85.23	97.00	56.31	61.23	62.95	67.00	56.57
1212	96.92	92.73	86.70	82.50	96.90	92.83	93.36	95.60	93.80	88.40
1213	96.17	91.73	87.00	83.80	95.90	85.42	89.45	91.80	90.20	81.40
1215	96.50	93.55	91.45	87.36	96.82	67.42	71.09	68.73	73.09	65.00
1216	96.73	90.92	81.85	74.29	96.54	81.13	85.08	89.08	86.79	79.85
1217	96.75	90.18	82.25	83.00	96.36	98.00	104.36	109.17	108.18	97.82
1218	96.00	90.64	84.36	80.36	96.18	86.75	94.09	95.36	93.82	75.73
1219	96.75	94.82	91.45	89.91	97.00	69.17	74.00	73.36	71.82	65.45
1220	96.69	91.27	87.82	85.36	97.00	82.23	88.45	89.91	97.00	85.00
1221	97.00	92.91	85.45	79.09	97.09	94.31	98.27	101.82	105.91	93.09
1222	96.92	92.40	87.40	83.00	96.50	86.92	86.70	86.70	86.30	75.30
1223	96.62	91.75	85.00	76.58	96.46	80.62	88.75	96.36	100.17	78.08
1224	97.58	95.09	90.64	88.80	97.40	68.17	71.18	69.82	72.80	65.20
1225	97.33	92.36	82.58	81.00	96.73	87.75	90.27	92.83	94.27	83.00
1226	96.64	93.92	77.36	86.44	96.54	78.50	76.54	76.14	76.06	65.85
1227	96.92	92.69	86.93	85.46	97.83	66.77	70.08	76.14	71.92	63.67
1229	96.79	93.50	85.42	79.30	97.36	82.79	80.25	85.08	87.90	73.73
1231	96.09	90.82	80.18	72.27	97.09	67.73	72.73	79.55	82.09	62.91
1232	97.46	92.21	85.29	82.38	98.54	81.92	82.71	81.43	83.85	78.69
1233	97.00	91.45	84.00	79.91	97.36	80.42	82.36	81.64	76.55	66.09
1234	97.25	91.40	83.73	76.55	96.09	75.17	77.00	78.55	78.91	62.45
1235	96.77	93.83	88.42	86.82	96.75	63.69	62.33	64.58	64.64	57.83
1236	96.67	93.18	88.58	86.00	96.45	73.67	75.00	75.58	75.00	70.18
1237	97.17	93.18	86.18	80.00	96.80	52.50	58.00	68.82	70.40	44.90
1238	96.23	87.73	76.82	76.38	95.94	65.31	66.47	70.64	71.38	64.69
1239	97.08	93.45	87.30	82.70	97.20	60.75	65.00	73.60	71.30	58.30
1240	97.57	92.36	83.40	78.07	97.13	63.57	67.64	70.53	74.93	58.27
1241	97.08	93.54	87.85	82.73	97.07	106.25	113.08	116.85	116.67	103.21

Appendix E. Oculometrics Recorded in the Mild Traumatic Brain Injury Subjects.

Subject	Pupil Diameter (mm)					Pupil Response Amplitude (mm)				
Number	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
1101	5.353	5.071	4.689	5.065	5.357	0.983	1.117	1.169	1.117	1.248
1102	5.523	5.120	4.811	5.053	5.675	1.331	1.100	1.063	1.022	1.339
1103	6.544	6.591	6.545	6.464	6.378	1.586	1.582	1.553	1.517	1.531
1104	3.953	4.266	.	3.008	.	0.965	0.918	.	0.454	.
1105	5.856	5.622	5.445	5.314	5.243	1.758	1.563	1.425	1.310	1.240
1106	5.071	4.971	4.774	4.681	4.165	1.534	1.573	1.609	1.650	1.461
1107	3.849	4.150	3.527	3.713	4.363	1.073	1.163	1.017	0.976	1.187
1109	7.579	7.244	7.317	7.416	6.868	1.166	1.409	1.320	1.275	1.465
1111	4.096	3.904	4.174	4.170	4.469	0.892	0.817	1.003	0.905	1.032
1112	5.930	6.104	6.273	6.039	6.330	1.122	1.212	0.965	1.092	1.155
1113	7.031	7.466	7.244	.	.	0.984	0.731	1.120	.	.
1114	6.755	6.026	6.591	6.033	6.419	1.113	1.079	0.999	1.008	1.016
1116	6.074	5.850	5.826	5.811	5.323	1.404	1.347	1.456	1.341	1.192
1117	6.339	5.925	5.826	5.644	6.029	1.092	1.333	1.406	1.319	1.143
1118	4.063	3.881	3.998	3.956	4.061	0.881	1.027	1.055	1.030	1.063
1119	4.713	4.996	5.228	5.152	5.366	1.142	1.315	1.358	1.354	1.462
1120	5.559	5.502	5.354	5.399	5.473	0.556	0.532	0.551	0.702	0.659
1121	4.452	4.724	4.376	4.064	4.123	1.026	1.109	0.900	0.882	1.013
1122	3.914	3.926	3.792	3.943	3.998	0.849	0.872	0.688	0.839	0.789
1123	5.293	5.157	5.392	5.447	5.079	0.967	0.848	0.983	1.032	0.860
1124	5.892	5.772	5.432	5.833	5.586	1.084	1.041	0.996	1.086	1.094
1125	6.575	6.628	6.329	6.240	6.422	1.106	1.186	1.065	0.927	1.241
1126	6.570	6.616	6.377	6.495	6.078	1.467	1.302	1.385	1.286	1.402
1127	5.408	5.600	5.263	5.173	5.353	1.282	1.280	1.121	1.148	1.116
1129	5.922	5.460	4.981	5.187	5.299	0.820	0.785	0.794	0.740	0.763
1130	4.927	4.850	4.787	4.031	4.690	1.090	1.130	1.106	0.927	1.114
1132	5.856	5.826	5.486	5.552	5.668	1.242	1.334	1.310	1.315	1.243
1133	3.941	3.698	3.797	3.567	4.176	1.026	0.966	0.966	0.930	1.066
1134	6.426	6.184	5.846	5.215	5.783	1.318	1.259	1.243	0.995	1.297
1135	3.413	3.887	.	3.440	4.018	1.109	1.144	.	0.997	1.114
1136	5.913	5.705	5.681	5.801	5.613	1.355	1.280	1.250	1.304	1.293
1137	5.034	4.666	4.888	4.984	4.863	0.892	0.752	0.723	0.703	0.793
1138	5.213	4.470	4.218	3.991	4.254	0.954	0.761	0.676	0.715	0.811
1139	4.481	4.493	4.358	4.074	4.582	0.716	0.790	0.766	0.743	0.806
1140	5.742	5.543	5.117	4.441	4.463	1.372	1.124	0.952	0.837	0.898
1141	4.167	4.277	4.124	3.803	3.706	1.207	1.173	1.259	1.004	0.941

Note. Subjects 1104, 1113, and 1135 had conditions in which the FIT did not measure the pupil accurately. It is interesting to note that both the mTBI and control groups had the same number, five, conditions in which the FIT did not accurately capture data because this is indicative of a constant error rate.

Oculometrics Recorded in the Mild Traumatic Brain Injury Subjects, continued.

Subject	Pupil Response Latency (ms)					Saccadic Velocity (deg/sec)				
Number	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
1101	318.352	305.356	309.082	309.271	320.719	71.528	68.320	68.938	70.196	68.344
1102	311.362	322.875	306.062	326.848	307.708	74.824	73.893	72.878	71.247	68.814
1103	285.071	284.074	292.156	290.750	290.316	75.998	73.308	72.642	75.259	75.556
1104	283.831	294.391	.	328.580	.	68.029	62.621	63.974	52.951	.
1105	263.482	270.980	277.094	289.877	304.468	66.822	62.372	64.995	62.778	64.558
1106	286.685	280.061	283.140	282.082	286.440	76.268	66.104	67.813	61.813	59.328
1107	268.763	277.407	268.164	269.976	278.179	66.608	63.553	64.102	65.634	65.961
1109	301.252	294.592	309.531	295.544	304.580	83.126	82.355	79.461	85.994	83.862
1111	265.997	263.959	260.532	271.407	271.730	83.648	81.172	81.368	82.724	81.289
1112	277.045	282.777	285.062	267.559	275.637	72.631	70.387	70.660	73.829	69.759
1113	296.118	307.131	295.451	.	.	68.785	66.186	63.777	63.237	61.680
1114	298.030	291.513	301.036	296.421	304.366	70.320	68.209	66.377	74.232	64.471
1116	293.429	296.058	296.580	285.880	290.865	75.704	75.529	65.567	63.910	56.783
1117	307.231	292.349	288.699	290.050	313.641	67.992	67.537	67.033	65.554	72.839
1118	289.269	283.268	287.395	289.199	281.510	71.947	64.883	66.243	65.119	66.908
1119	325.403	329.825	328.123	330.237	318.406	72.368	76.916	81.488	76.104	74.798
1120	361.514	356.838	352.289	342.544	339.469	84.324	74.223	71.144	68.776	71.195
1121	295.933	289.574	289.033	281.493	281.768	70.263	63.829	64.764	66.854	65.021
1122	282.396	278.010	296.780	283.037	298.622	73.609	71.736	70.259	68.192	74.294
1123	344.410	330.620	330.800	340.325	355.043	67.258	64.898	74.648	63.166	60.835
1124	320.901	301.740	306.249	312.322	298.873	71.218	74.412	72.385	74.465	75.035
1125	328.559	328.269	326.637	335.215	319.548	66.259	61.491	72.077	60.614	60.690
1126	288.064	300.090	289.629	288.421	289.107	77.210	77.248	77.619	72.796	71.644
1127	309.459	307.548	318.131	308.940	319.727	72.886	68.930	71.938	72.917	71.989
1129	332.703	326.383	343.893	334.102	360.957	81.548	81.961	82.854	80.770	82.794
1130	267.116	266.912	254.758	250.369	257.250	91.329	86.244	88.421	90.872	88.761
1132	305.925	306.508	288.773	315.154	313.787	82.182	82.810	82.081	81.986	82.907
1133	281.833	286.362	289.392	284.049	296.708	84.471	86.844	82.477	85.825	80.928
1134	290.087	286.253	299.405	313.738	291.630	66.147	58.704	63.455	58.528	75.348
1135	271.581	282.090	.	283.259	280.009	65.142	66.632	64.043	68.262	65.535
1136	288.648	294.222	308.914	300.411	292.466	81.499	79.753	83.278	81.929	82.564
1137	291.448	309.098	335.881	301.807	327.881	70.570	74.440	69.340	75.765	73.919
1138	301.006	291.359	292.162	302.084	284.728	63.416	69.179	69.560	65.087	64.892
1139	293.453	286.416	305.993	297.414	303.993	66.386	69.929	72.430	68.461	64.295
1140	309.880	314.158	313.708	314.136	312.811	69.823	66.707	66.967	63.317	66.792
1141	314.475	307.785	306.883	294.483	306.764	79.957	83.795	82.453	83.169	78.076

Note. Subjects 1104, 1113, and 1135 had conditions in which the FIT did not measure the pupil accurately. It is interesting to note that both the mTBI and control groups had the same number, five, conditions in which the FIT did not accurately capture data because this is indicative of a constant error rate.

Appendix F. Oculometrics Recorded in the Control Subjects.

Subject	Pupil Diameter (mm)					Pupil Response Amplitude (mm)				
Number	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
1201	6.354	5.829	6.334	5.036	5.818	1.340	1.532	1.348	1.060	1.287
1202	6.153	6.058	6.255	5.884	6.241	1.489	1.367	1.530	1.620	1.499
1203	5.433	5.698	5.303	4.608	5.533	1.447	1.500	1.399	1.215	1.436
1204	4.945	4.451	4.256	4.385	4.873	1.174	1.103	0.919	1.087	1.253
1205	7.124	7.281	7.012	7.175	7.141	1.160	1.268	1.204	0.989	1.144
1206	3.903	3.942	.	3.862	4.199	1.182	1.233	.	1.169	1.284
1207	6.158	6.268	5.972	6.336	6.226	1.344	1.343	1.336	1.089	1.318
1209	7.426	7.176	7.158	7.026	7.368	0.890	1.029	0.833	0.791	0.855
1211	5.775	5.818	.	5.029	5.419	1.356	1.116	.	1.109	1.083
1212	7.329	7.137	7.169	7.119	6.852	1.054	1.007	1.028	1.011	1.021
1213	6.557	6.141	5.962	5.761	5.864	1.088	1.050	1.032	1.053	1.100
1215	6.333	6.197	5.922	6.411	6.632	1.280	1.333	1.374	1.242	1.423
1216	6.127	5.502	5.028	4.299	5.158	1.529	1.493	1.252	1.045	1.466
1217	5.146	5.120	5.039	4.900	4.714	0.932	0.856	0.980	0.874	0.877
1218	5.957	5.519	5.490	5.618	5.175	1.421	1.232	1.137	1.242	1.116
1219	4.544	4.389	4.415	4.358	4.597	0.679	0.664	0.645	0.715	0.760
1220	4.932	4.939	4.821	5.142	5.148	1.050	1.030	1.023	0.928	1.089
1221	6.767	6.423	6.447	6.393	6.866	1.048	1.176	1.116	1.062	0.947
1222	6.967	6.857	6.849	6.682	6.602	0.804	0.672	0.631	0.758	0.783
1223	5.108	5.470	4.696	4.686	4.412	1.205	1.139	1.154	1.448	1.203
1224	6.243	6.185	6.162	5.963	5.998	0.924	0.982	0.976	0.977	1.167
1225	5.824	5.517	5.279	5.087	5.736	1.149	1.136	1.087	1.062	1.099
1226	6.574	6.455	6.349	6.242	6.750	1.355	1.430	1.130	1.367	1.481
1227	5.166	4.364	4.450	4.735	4.869	1.430	1.150	1.212	1.281	1.376
1229	7.185	7.022	7.157	7.238	7.060	1.672	1.119	1.177	1.113	1.236
1231	5.434	4.719	4.749	3.988	5.096	1.198	0.927	0.995	0.801	1.098
1232	4.907	4.906	4.501	4.461	4.362	1.576	1.558	1.520	1.424	1.486
1233	5.383	5.549	5.565	5.346	5.701	1.258	1.174	1.096	1.054	1.092
1234	4.937	4.950	4.727	4.356	4.984	0.906	0.913	0.885	0.736	0.880
1235	4.470	4.194	4.073	3.861	4.269	1.066	0.990	1.069	0.957	1.043
1236	5.091	4.804	5.005	4.867	5.030	1.343	1.300	1.202	1.120	1.215
1237	5.993	6.054	5.769	5.486	5.476	1.129	1.062	1.083	0.894	1.189
1238	5.152	5.472	5.446	5.173	.	0.477	0.447	0.515	0.459	.
1239	5.489	4.940	5.331	4.988	5.052	1.063	0.892	1.016	0.918	0.993
1240	5.785	4.966	4.993	4.830	.	1.071	0.802	0.911	0.704	.
1241	6.473	6.546	6.005	.	5.594	1.337	1.221	1.336	.	1.174

Note. Subjects 1206, 1211, 1238, 1240, and 1241 had conditions in which the FIT did not measure the pupil accurately. It is interesting to note that both the mTBI and control groups had the same number, five, conditions in which the FIT did not accurately capture data because this is indicative of a constant error rate.

Oculometrics Recorded in the Control Subjects, continued.

Subject Number	Pupil Response Latency (ms)					Saccadic Velocity (deg/sec)				
	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2	MSL-1	8,000 ft	12,000 ft	14,000 ft	MSL-2
1201	310.497	299.175	322.447	318.533	318.257	71.587	75.896	72.481	72.951	73.775
1202	279.793	285.982	278.581	267.291	278.282	67.237	67.694	64.779	68.415	64.114
1203	313.519	308.852	318.342	291.713	312.004	64.620	69.545	66.909	60.604	58.897
1204	304.763	295.081	294.860	286.228	289.478	66.144	68.064	67.326	67.019	64.829
1205	317.948	310.626	312.466	324.519	313.779	76.260	78.394	80.417	71.895	77.744
1206	284.216	290.499	.	286.102	286.514	72.193	74.094	.	72.134	76.698
1207	298.708	283.337	296.139	300.915	299.858	77.535	81.658	74.857	70.834	75.964
1209	282.820	276.393	296.130	293.770	289.911	70.583	75.060	73.508	68.833	77.369
1211	291.381	314.275	.	298.973	313.165	87.196	82.632	83.210	77.086	87.040
1212	307.365	314.991	311.480	319.443	312.923	65.226	64.507	64.515	62.923	63.633
1213	309.528	309.733	310.641	298.715	295.751	69.495	72.851	72.108	70.752	70.408
1215	279.726	271.488	267.826	288.919	284.845	68.861	70.328	70.830	64.152	67.962
1216	294.102	268.532	280.904	279.924	274.835	76.839	78.354	79.036	68.370	76.721
1217	360.657	357.502	342.300	342.364	359.454	85.153	79.579	78.124	84.512	72.516
1218	285.903	304.678	306.616	307.262	296.139	68.665	71.160	68.417	70.795	66.983
1219	280.386	281.825	290.054	275.486	276.505	68.219	69.215	68.247	72.027	64.771
1220	270.514	264.621	267.224	278.269	269.078	82.651	86.573	85.918	80.268	88.419
1221	272.830	271.592	277.656	267.941	270.395	73.791	70.179	69.311	66.293	71.931
1222	348.633	348.162	335.839	324.868	342.548	59.999	65.244	67.365	67.309	64.131
1223	290.739	294.818	283.164	278.760	284.010	66.220	61.756	66.248	67.950	70.071
1224	310.615	295.353	305.238	297.515	294.217	88.747	94.852	92.264	91.660	90.464
1225	281.990	286.158	291.699	281.036	291.990	70.569	71.906	72.863	68.054	64.371
1226	288.980	295.483	310.776	309.122	300.842	81.736	70.521	74.013	69.805	69.532
1227	244.671	247.498	246.406	245.275	240.477	61.485	69.357	65.430	68.074	69.548
1229	293.458	310.769	305.149	301.047	306.201	78.295	82.976	80.532	79.519	76.498
1231	281.319	282.377	286.910	277.065	287.902	84.115	84.565	76.639	83.709	83.966
1232	258.334	261.335	251.344	254.905	249.161	72.817	70.609	69.973	69.083	68.441
1233	259.938	274.602	272.995	267.303	272.280	65.260	71.891	62.248	65.454	60.843
1234	294.206	303.489	295.408	290.038	300.241	75.272	79.137	76.146	73.032	66.946
1235	303.010	300.238	290.290	287.967	298.735	73.484	72.477	70.146	72.610	71.230
1236	311.227	304.568	321.250	332.550	333.002	70.918	72.522	68.075	67.528	69.791
1237	297.020	305.872	302.106	317.130	306.002	66.895	66.167	67.567	67.573	70.592
1238	378.888	367.296	373.135	364.819	.	65.474	65.536	64.607	63.705	62.916
1239	287.798	289.888	280.270	294.883	278.641	73.135	69.684	65.494	69.319	69.225
1240	313.113	318.085	305.015	315.400	.	64.024	70.968	65.341	71.565	65.913
1241	316.965	312.180	304.640	.	324.633	86.998	85.767	79.678	86.164	80.360

Note. Subjects 1206, 1211, 1238, 1240, and 1241 had conditions in which the FIT did not measure the pupil accurately. It is interesting to note that both the mTBI and control groups had the same number, five, conditions in which the FIT did not accurately capture data because this is indicative of a constant error rate.

Appendix G. Correlation Matrix Among All Variables for the Mild Traumatic Brain Injury Subjects.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
Age	Pearson Correlation	-.327	1	.300	.318	.401	.329	.453	.059
	Sig. (2-tailed)	.051		.075	.059	.015	.050	.006	.731
	N	36	36	36	36	36	36	36	36
Pulse	Pearson Correlation	.128	.300	1	.408	.542	.163	.312	-.056
	Sig. (2-tailed)	.457	.075		.014	.001	.343	.064	.745
	N	36	36	36	36	36	36	36	36
BPsystolic	Pearson Correlation	-.375	.318	.408	1	.658	.108	.539	.489
	Sig. (2-tailed)	.024	.059	.014		.000	.531	.001	.002
	N	36	36	36	36	36	36	36	36
BPDiastolic	Pearson Correlation	-.027	.401	.542	.658	1	.256	.417	.073
	Sig. (2-tailed)	.878	.015	.001	.000		.132	.011	.672
	N	36	36	36	36	36	36	36	36
Respiration	Pearson Correlation	-.117	.329	.163	.108	.256	1	.145	-.052
	Sig. (2-tailed)	.498	.050	.343	.531	.132		.399	.762
	N	36	36	36	36	36	36	36	36
Weight	Pearson Correlation	-.376	.453	.312	.539	.417	.145	1	.476
	Sig. (2-tailed)	.024	.006	.064	.001	.011	.399		.003
	N	36	36	36	36	36	36	36	36
Height_inches	Pearson Correlation	-.611	.059	-.056	.489	.073	-.052	.476	1
	Sig. (2-tailed)	.000	.731	.745	.002	.672	.762	.003	
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		BMI	MonthsPost_Inj	LOC	Amnesia	OX_PreSL	OX_8k	OX_12k	OX_14k
Sex	Pearson Correlation	-.175	.002	-.096	.000	.409	.276	.127	-.002
	Sig. (2-tailed)	.308	.989	.576	1.000	.013	.104	.459	.989
	N	36	36	36	36	36	36	36	36
Age	Pearson Correlation	.460	.164	.076	.381	-.575	-.327	-.097	.086
	Sig. (2-tailed)	.005	.339	.661	.022	.000	.052	.574	.620
	N	36	36	36	36	36	36	36	36
Pulse	Pearson Correlation	.316	-.344	-.123	.169	-.166	-.377	-.315	-.163
	Sig. (2-tailed)	.060	.040	.473	.325	.333	.023	.062	.342
	N	36	36	36	36	36	36	36	36
BPsystolic	Pearson Correlation	.394	-.049	.001	.233	-.085	-.047	.071	.237
	Sig. (2-tailed)	.018	.776	.994	.171	.622	.786	.681	.164
	N	36	36	36	36	36	36	36	36
BPDiastolic	Pearson Correlation	.389	-.047	.024	.325	.006	-.050	.004	.106
	Sig. (2-tailed)	.019	.784	.891	.053	.971	.773	.982	.537
	N	36	36	36	36	36	36	36	36
Respiration	Pearson Correlation	.170	-.140	-.299	.200	-.211	-.077	.003	.159
	Sig. (2-tailed)	.322	.417	.076	.242	.217	.655	.986	.355
	N	36	36	36	36	36	36	36	36
Weight	Pearson Correlation	.938	.208	.016	.114	-.071	-.075	-.045	.041
	Sig. (2-tailed)	.000	.222	.928	.507	.682	.662	.792	.815
	N	36	36	36	36	36	36	36	36
Height_inches	Pearson Correlation	.186	-.033	.092	-.104	.024	.017	.091	.185
	Sig. (2-tailed)	.277	.850	.595	.547	.888	.920	.599	.280
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		OX_PostSL	PLBPM_PreSL	PLBPM_8k	PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL
Sex	Pearson Correlation	.381	-.098	-.058	-.103	-.045	.018	.066
	Sig. (2-tailed)	.022	.569	.735	.550	.796	.918	.703
	N	36	36	36	36	36	36	36
Age	Pearson Correlation	-.586	.274	.296	.371	.326	.274	-.315
	Sig. (2-tailed)	.000	.106	.079	.026	.052	.105	.061
	N	36	36	36	36	36	36	36
Pulse	Pearson Correlation	-.321	.819	.816	.753	.750	.803	-.045
	Sig. (2-tailed)	.056	.000	.000	.000	.000	.000	.796
	N	36	36	36	36	36	36	36
BPsystolic	Pearson Correlation	-.311	.415	.425	.400	.378	.401	-.195
	Sig. (2-tailed)	.065	.012	.010	.016	.023	.015	.255
	N	36	36	36	36	36	36	36
BPDiastolic	Pearson Correlation	-.156	.599	.659	.640	.668	.633	-.253
	Sig. (2-tailed)	.364	.000	.000	.000	.000	.000	.137
	N	36	36	36	36	36	36	36
Respiration	Pearson Correlation	-.160	.245	.283	.300	.243	.224	-.179
	Sig. (2-tailed)	.351	.150	.095	.075	.153	.189	.295
	N	36	36	36	36	36	36	36
Weight	Pearson Correlation	-.341	.482	.498	.569	.541	.512	-.111
	Sig. (2-tailed)	.042	.003	.002	.000	.001	.001	.518
	N	36	36	36	36	36	36	36
Height_inches	Pearson Correlation	-.156	.169	.152	.183	.106	.126	.040
	Sig. (2-tailed)	.365	.325	.377	.284	.537	.465	.816
	N	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITD_8k	FITD_12k	FITD_14k	FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k
	Pearson Correlation	.086	-.054	.079	-.016	.212	.140	.015	.085
Sex	Sig. (2-tailed)	.618	.761	.653	.930	.214	.417	.934	.629
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.269	-.213	-.234	-.263	-.304	-.129	-.104	-.022
Age	Sig. (2-tailed)	.112	.227	.175	.133	.072	.453	.558	.901
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.027	-.084	-.123	-.123	.135	.142	.058	.050
Pulse	Sig. (2-tailed)	.876	.637	.480	.490	.432	.410	.743	.774
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.228	-.234	-.278	-.264	-.283	-.251	-.258	-.232
BPsystolic	Sig. (2-tailed)	.182	.183	.106	.131	.095	.140	.141	.180
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.194	-.188	-.352	-.297	-.255	-.268	-.301	-.238
BPDiastolic	Sig. (2-tailed)	.257	.288	.038	.088	.134	.113	.083	.169
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.177	-.133	-.158	-.192	.048	-.077	-.112	-.151
Respiration	Sig. (2-tailed)	.301	.454	.365	.277	.783	.654	.528	.387
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.124	-.082	-.158	-.206	-.209	-.064	.119	.115
Weight	Sig. (2-tailed)	.471	.645	.366	.241	.221	.713	.501	.510
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.024	-.054	.016	-.001	-.293	-.261	-.106	-.102
Height_inches	Sig. (2-tailed)	.888	.762	.929	.995	.083	.125	.550	.559
	N	36	34	35	34	36	36	34	35

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITA_PostSL	FITL_PreSL	FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k
Sex	Pearson Correlation	-.058	.115	.064	.000	.138	.225	-.108	-.111
	Sig. (2-tailed)	.743	.505	.712	.999	.428	.200	.531	.520
	N	34	36	36	34	35	34	36	36
Age	Pearson Correlation	-.101	.143	.102	.134	.088	-.017	-.095	-.173
	Sig. (2-tailed)	.569	.405	.555	.449	.615	.923	.581	.314
	N	34	36	36	34	35	34	36	36
Pulse	Pearson Correlation	-.085	.093	.024	-.088	-.021	-.077	-.152	-.206
	Sig. (2-tailed)	.632	.591	.888	.620	.903	.663	.378	.229
	N	34	36	36	34	35	34	36	36
BPsystolic	Pearson Correlation	-.214	-.061	-.060	-.132	-.214	-.208	.174	.177
	Sig. (2-tailed)	.224	.724	.730	.458	.216	.237	.310	.303
	N	34	36	36	34	35	34	36	36
BPDiastolic	Pearson Correlation	-.324	-.064	-.032	-.058	-.156	-.071	-.092	-.154
	Sig. (2-tailed)	.062	.713	.852	.746	.370	.688	.592	.371
	N	34	36	36	34	35	34	36	36
Respiration	Pearson Correlation	-.105	.101	.229	.280	.281	.174	-.216	-.259
	Sig. (2-tailed)	.556	.557	.180	.109	.103	.326	.206	.127
	N	34	36	36	34	35	34	36	36
Weight	Pearson Correlation	-.028	.178	.084	.008	-.030	.034	.241	.140
	Sig. (2-tailed)	.876	.298	.627	.965	.864	.849	.156	.415
	N	34	36	36	34	35	34	36	36
Height_inches	Pearson Correlation	-.138	.217	.241	.207	.099	.149	.239	.273
	Sig. (2-tailed)	.437	.203	.157	.240	.571	.400	.160	.108
	N	34	36	36	34	35	34	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITV_12k	FITV_14k	FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k
Sex	Pearson Correlation	-.041	-.047	-.012	.336	.294	.341	.300
	Sig. (2-tailed)	.812	.786	.946	.045	.082	.042	.076
	N	36	36	35	36	36	36	36
Age	Pearson Correlation	.001	-.157	-.080	-.054	-.160	-.075	-.173
	Sig. (2-tailed)	.996	.360	.647	.756	.350	.663	.313
	N	36	36	35	36	36	36	36
Pulse	Pearson Correlation	-.125	-.221	-.081	.109	.102	.245	.109
	Sig. (2-tailed)	.467	.195	.643	.525	.554	.150	.527
	N	36	36	35	36	36	36	36
BPsystolic	Pearson Correlation	.177	.215	.232	-.064	-.230	-.132	-.094
	Sig. (2-tailed)	.303	.207	.181	.709	.177	.442	.584
	N	36	36	35	36	36	36	36
BPDiastolic	Pearson Correlation	-.107	-.068	-.011	.026	-.088	.069	.126
	Sig. (2-tailed)	.536	.695	.949	.879	.611	.691	.463
	N	36	36	35	36	36	36	36
Respiration	Pearson Correlation	-.192	-.356	-.217	.135	-.068	-.110	-.224
	Sig. (2-tailed)	.262	.033	.211	.431	.696	.523	.190
	N	36	36	35	36	36	36	36
Weight	Pearson Correlation	.231	.089	.126	.015	-.161	-.082	-.114
	Sig. (2-tailed)	.176	.606	.471	.932	.347	.635	.510
	N	36	36	35	36	36	36	36
Height_inches	Pearson Correlation	.237	.193	.108	-.183	-.283	-.387	-.346
	Sig. (2-tailed)	.164	.260	.538	.286	.095	.020	.039
	N	36	36	35	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		ESQams_PostSL
	Pearson Correlation	.249
Sex	Sig. (2-tailed)	.143
	N	36
	Pearson Correlation	-.203
Age	Sig. (2-tailed)	.234
	N	36
	Pearson Correlation	.009
Pulse	Sig. (2-tailed)	.959
	N	36
	Pearson Correlation	-.267
BPsystolic	Sig. (2-tailed)	.115
	N	36
	Pearson Correlation	-.178
BPDiastolic	Sig. (2-tailed)	.300
	N	36
	Pearson Correlation	-.225
Respiration	Sig. (2-tailed)	.186
	N	36
	Pearson Correlation	-.111
Weight	Sig. (2-tailed)	.520
	N	36
	Pearson Correlation	-.212
Height_inches	Sig. (2-tailed)	.213
	N	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
	Pearson Correlation	-.175	.460	.316	.394	.389	.170	.938	.186
BMI	Sig. (2-tailed)	.308	.005	.060	.018	.019	.322	.000	.277
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.002	.164	-.344	-.049	-.047	-.140	.208	-.033
MonthsPost_Inj	Sig. (2-tailed)	.989	.339	.040	.776	.784	.417	.222	.850
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.096	.076	-.123	.001	.024	-.299	.016	.092
LOC	Sig. (2-tailed)	.576	.661	.473	.994	.891	.076	.928	.595
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.000	.381	.169	.233	.325	.200	.114	-.104
Amnesia	Sig. (2-tailed)	1.000	.022	.325	.171	.053	.242	.507	.547
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.409	-.575	-.166	-.085	.006	-.211	-.071	.024
OX_PreSL	Sig. (2-tailed)	.013	.000	.333	.622	.971	.217	.682	.888
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.276	-.327	-.377	-.047	-.050	-.077	-.075	.017
OX_8k	Sig. (2-tailed)	.104	.052	.023	.786	.773	.655	.662	.920
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.127	-.097	-.315	.071	.004	.003	-.045	.091
OX_12k	Sig. (2-tailed)	.459	.574	.062	.681	.982	.986	.792	.599
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.002	.086	-.163	.237	.106	.159	.041	.185
OX_14k	Sig. (2-tailed)	.989	.620	.342	.164	.537	.355	.815	.280
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		BMI	MonthsPost_Inj	LOC	Amnesia	OX_PreSL	OX_8k	OX_12k	OX_14k
BMI	Pearson Correlation	1	.298	-.041	.090	-.057	-.042	-.037	.023
	Sig. (2-tailed)		.078	.814	.602	.742	.808	.831	.893
	N	36	36	36	36	36	36	36	36
MonthsPost_Inj	Pearson Correlation	.298	1	.166	-.083	-.002	.217	.270	.232
	Sig. (2-tailed)	.078		.334	.628	.990	.203	.111	.173
	N	36	36	36	36	36	36	36	36
LOC	Pearson Correlation	-.041	.166	1	.334	-.015	-.168	-.094	-.199
	Sig. (2-tailed)	.814	.334		.046	.929	.328	.584	.244
	N	36	36	36	36	36	36	36	36
Amnesia	Pearson Correlation	.090	-.083	.334	1	-.299	-.332	-.318	-.229
	Sig. (2-tailed)	.602	.628	.046		.076	.048	.059	.179
	N	36	36	36	36	36	36	36	36
OX_PreSL	Pearson Correlation	-.057	-.002	-.015	-.299	1	.671	.506	.265
	Sig. (2-tailed)	.742	.990	.929	.076		.000	.002	.119
	N	36	36	36	36	36	36	36	36
OX_8k	Pearson Correlation	-.042	.217	-.168	-.332	.671	1	.845	.682
	Sig. (2-tailed)	.808	.203	.328	.048	.000		.000	.000
	N	36	36	36	36	36	36	36	36
OX_12k	Pearson Correlation	-.037	.270	-.094	-.318	.506	.845	1	.859
	Sig. (2-tailed)	.831	.111	.584	.059	.002	.000		.000
	N	36	36	36	36	36	36	36	36
OX_14k	Pearson Correlation	.023	.232	-.199	-.229	.265	.682	.859	1
	Sig. (2-tailed)	.893	.173	.244	.179	.119	.000	.000	
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		OX_PostSL	PLBPM_PreSL	PLBPM_8k	PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL
BMI	Pearson Correlation	-.308	.441	.465	.536	.527	.499	-.089
	Sig. (2-tailed)	.068	.007	.004	.001	.001	.002	.604
	N	36	36	36	36	36	36	36
MonthsPost_Inj	Pearson Correlation	-.089	-.200	-.158	-.089	-.102	-.186	.303
	Sig. (2-tailed)	.605	.243	.356	.606	.554	.278	.072
	N	36	36	36	36	36	36	36
LOC	Pearson Correlation	-.199	.003	-.076	.003	.046	.002	.165
	Sig. (2-tailed)	.244	.986	.659	.986	.788	.989	.336
	N	36	36	36	36	36	36	36
Amnesia	Pearson Correlation	-.345	.129	.163	.263	.237	.142	-.346
	Sig. (2-tailed)	.039	.452	.341	.121	.164	.410	.039
	N	36	36	36	36	36	36	36
OX_PreSL	Pearson Correlation	.555	-.132	-.121	-.202	-.157	-.052	.143
	Sig. (2-tailed)	.000	.443	.481	.237	.361	.762	.406
	N	36	36	36	36	36	36	36
OX_8k	Pearson Correlation	.563	-.251	-.254	-.320	-.326	-.204	.039
	Sig. (2-tailed)	.000	.140	.135	.057	.053	.232	.821
	N	36	36	36	36	36	36	36
OX_12k	Pearson Correlation	.347	-.269	-.274	-.368	-.380	-.211	.094
	Sig. (2-tailed)	.038	.113	.106	.027	.022	.216	.588
	N	36	36	36	36	36	36	36
OX_14k	Pearson Correlation	.182	-.110	-.113	-.214	-.275	-.083	.088
	Sig. (2-tailed)	.288	.523	.513	.210	.104	.632	.609
	N	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITD_8k	FITD_12k	FITD_14k	FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k
	Pearson Correlation	-.104	-.075	-.137	-.201	-.153	-.015	.136	.151
BMI	Sig. (2-tailed)	.547	.673	.433	.255	.372	.931	.443	.386
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.316	.332	.281	.266	-.199	-.185	-.097	-.066
MonthsPost_Inj	Sig. (2-tailed)	.060	.055	.101	.129	.244	.281	.583	.706
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.180	.274	.070	.157	-.121	.012	.082	-.032
LOC	Sig. (2-tailed)	.293	.117	.689	.376	.484	.943	.644	.856
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.287	-.212	-.270	-.319	-.328	-.220	-.313	-.197
Amnesia	Sig. (2-tailed)	.090	.230	.116	.066	.050	.197	.071	.256
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.073	-.025	.138	.096	.203	.211	.109	.181
OX_PreSL	Sig. (2-tailed)	.674	.888	.429	.589	.235	.217	.539	.298
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.000	-.077	.061	.025	.037	.004	-.082	.051
OX_8k	Sig. (2-tailed)	.998	.667	.726	.889	.830	.984	.644	.769
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.082	-.036	.106	.030	.063	.029	-.050	.100
OX_12k	Sig. (2-tailed)	.634	.838	.546	.865	.715	.866	.780	.566
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.089	-.011	.122	-.034	.015	-.049	-.099	.073
OX_14k	Sig. (2-tailed)	.606	.951	.485	.846	.929	.776	.578	.676
	N	36	34	35	34	36	36	34	35

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITA_PostSL	FITL_PreSL	FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k
BMI	Pearson Correlation	-.016	.179	.044	-.023	-.013	.062	.184	.048
	Sig. (2-tailed)	.927	.296	.797	.898	.940	.726	.284	.783
	N	34	36	36	34	35	34	36	36
MonthsPost_Inj	Pearson Correlation	-.062	.174	.169	.208	.167	.222	.321	.211
	Sig. (2-tailed)	.727	.311	.324	.237	.338	.207	.056	.217
	N	34	36	36	34	35	34	36	36
LOC	Pearson Correlation	-.071	.021	-.019	.072	.030	.071	-.045	-.114
	Sig. (2-tailed)	.691	.903	.911	.686	.866	.690	.796	.507
	N	34	36	36	34	35	34	36	36
Amnesia	Pearson Correlation	-.249	.095	.089	.122	-.018	-.109	-.040	-.211
	Sig. (2-tailed)	.156	.580	.608	.492	.920	.538	.819	.216
	N	34	36	36	34	35	34	36	36
OX_PreSL	Pearson Correlation	.032	-.200	-.207	-.098	-.189	.140	.233	.235
	Sig. (2-tailed)	.856	.241	.225	.580	.276	.429	.171	.168
	N	34	36	36	34	35	34	36	36
OX_8k	Pearson Correlation	.011	-.121	-.098	-.007	-.055	.154	.067	.156
	Sig. (2-tailed)	.952	.483	.571	.970	.753	.385	.698	.363
	N	34	36	36	34	35	34	36	36
OX_12k	Pearson Correlation	.060	-.096	-.038	.081	-.013	.176	.079	.094
	Sig. (2-tailed)	.736	.578	.824	.648	.939	.319	.646	.587
	N	34	36	36	34	35	34	36	36
OX_14k	Pearson Correlation	.004	-.016	.024	.131	.009	.163	.113	.138
	Sig. (2-tailed)	.984	.926	.888	.459	.959	.358	.512	.422
	N	34	36	36	34	35	34	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITV_12k	FITV_14k	FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k
BMI	Pearson Correlation	.181	.011	.088	.135	-.069	.050	.044
	Sig. (2-tailed)	.289	.950	.613	.434	.688	.774	.798
	N	36	36	35	36	36	36	36
MonthsPost_Inj	Pearson Correlation	.390	.267	.292	.120	-.041	-.038	.118
	Sig. (2-tailed)	.019	.115	.088	.487	.814	.824	.495
	N	36	36	35	36	36	36	36
LOC	Pearson Correlation	-.228	-.101	-.036	-.225	-.175	-.226	-.216
	Sig. (2-tailed)	.182	.556	.839	.188	.307	.185	.206
	N	36	36	35	36	36	36	36
Amnesia	Pearson Correlation	-.288	-.160	-.184	.153	.118	.096	-.140
	Sig. (2-tailed)	.089	.351	.289	.374	.493	.578	.414
	N	36	36	35	36	36	36	36
OX_PreSL	Pearson Correlation	.153	.326	.340	-.187	-.199	-.162	-.022
	Sig. (2-tailed)	.374	.052	.046	.274	.245	.344	.900
	N	36	36	35	36	36	36	36
OX_8k	Pearson Correlation	.205	.307	.321	-.003	-.115	-.153	-.134
	Sig. (2-tailed)	.230	.069	.060	.988	.505	.373	.436
	N	36	36	35	36	36	36	36
OX_12k	Pearson Correlation	.190	.204	.260	-.171	-.315	-.330	-.206
	Sig. (2-tailed)	.266	.234	.132	.318	.061	.049	.229
	N	36	36	35	36	36	36	36
OX_14k	Pearson Correlation	.247	.232	.298	-.046	-.228	-.290	-.270
	Sig. (2-tailed)	.146	.173	.082	.789	.180	.086	.111
	N	36	36	35	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		ESQams_PostSL
	Pearson Correlation	.022
BMI	Sig. (2-tailed)	.900
	N	36
	Pearson Correlation	.119
MonthsPost_Inj	Sig. (2-tailed)	.488
	N	36
	Pearson Correlation	-.205
LOC	Sig. (2-tailed)	.231
	N	36
	Pearson Correlation	-.141
Amnesia	Sig. (2-tailed)	.413
	N	36
	Pearson Correlation	.089
OX_PreSL	Sig. (2-tailed)	.608
	N	36
	Pearson Correlation	-.202
OX_8k	Sig. (2-tailed)	.237
	N	36
	Pearson Correlation	-.294
OX_12k	Sig. (2-tailed)	.082
	N	36
	Pearson Correlation	-.304
OX_14k	Sig. (2-tailed)	.072
	N	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
OX_PostSL	Pearson Correlation	.381	-.586	-.321	-.311	-.156	-.160	-.341	-.156
	Sig. (2-tailed)	.022	.000	.056	.065	.364	.351	.042	.365
	N	36	36	36	36	36	36	36	36
PLBPM_PreSL	Pearson Correlation	-.098	.274	.819	.415	.599	.245	.482	.169
	Sig. (2-tailed)	.569	.106	.000	.012	.000	.150	.003	.325
	N	36	36	36	36	36	36	36	36
PLBPM_8k	Pearson Correlation	-.058	.296	.816	.425	.659	.283	.498	.152
	Sig. (2-tailed)	.735	.079	.000	.010	.000	.095	.002	.377
	N	36	36	36	36	36	36	36	36
PLBPM_12k	Pearson Correlation	-.103	.371	.753	.400	.640	.300	.569	.183
	Sig. (2-tailed)	.550	.026	.000	.016	.000	.075	.000	.284
	N	36	36	36	36	36	36	36	36
PLBPM_14k	Pearson Correlation	-.045	.326	.750	.378	.668	.243	.541	.106
	Sig. (2-tailed)	.796	.052	.000	.023	.000	.153	.001	.537
	N	36	36	36	36	36	36	36	36
PLBPM_PostSL	Pearson Correlation	.018	.274	.803	.401	.633	.224	.512	.126
	Sig. (2-tailed)	.918	.105	.000	.015	.000	.189	.001	.465
	N	36	36	36	36	36	36	36	36
FITD_PreSL	Pearson Correlation	.066	-.315	-.045	-.195	-.253	-.179	-.111	.040
	Sig. (2-tailed)	.703	.061	.796	.255	.137	.295	.518	.816
	N	36	36	36	36	36	36	36	36
FITD_8k	Pearson Correlation	.086	-.269	-.027	-.228	-.194	-.177	-.124	-.024
	Sig. (2-tailed)	.618	.112	.876	.182	.257	.301	.471	.888
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		BMI	MonthsPost_Inj	LOC	Amnesia	OX_PreSL	OX_8k	OX_12k	OX_14k
OX_PostSL	Pearson Correlation	-.308	-.089	-.199	-.345	.555	.563	.347	.182
	Sig. (2-tailed)	.068	.605	.244	.039	.000	.000	.038	.288
	N	36	36	36	36	36	36	36	36
PLBPM_PreSL	Pearson Correlation	.441	-.200	.003	.129	-.132	-.251	-.269	-.110
	Sig. (2-tailed)	.007	.243	.986	.452	.443	.140	.113	.523
	N	36	36	36	36	36	36	36	36
PLBPM_8k	Pearson Correlation	.465	-.158	-.076	.163	-.121	-.254	-.274	-.113
	Sig. (2-tailed)	.004	.356	.659	.341	.481	.135	.106	.513
	N	36	36	36	36	36	36	36	36
PLBPM_12k	Pearson Correlation	.536	-.089	.003	.263	-.202	-.320	-.368	-.214
	Sig. (2-tailed)	.001	.606	.986	.121	.237	.057	.027	.210
	N	36	36	36	36	36	36	36	36
PLBPM_14k	Pearson Correlation	.527	-.102	.046	.237	-.157	-.326	-.380	-.275
	Sig. (2-tailed)	.001	.554	.788	.164	.361	.053	.022	.104
	N	36	36	36	36	36	36	36	36
PLBPM_PostSL	Pearson Correlation	.499	-.186	.002	.142	-.052	-.204	-.211	-.083
	Sig. (2-tailed)	.002	.278	.989	.410	.762	.232	.216	.632
	N	36	36	36	36	36	36	36	36
FITD_PreSL	Pearson Correlation	-.089	.303	.165	-.346	.143	.039	.094	.088
	Sig. (2-tailed)	.604	.072	.336	.039	.406	.821	.588	.609
	N	36	36	36	36	36	36	36	36
FITD_8k	Pearson Correlation	-.104	.316	.180	-.287	.073	.000	.082	.089
	Sig. (2-tailed)	.547	.060	.293	.090	.674	.998	.634	.606
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		OX_PostSL	PLBPM_PreSL	PLBPM_8k	PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL
OX_PostSL	Pearson Correlation	1	-.292	-.307	-.378	-.326	-.225	.067
	Sig. (2-tailed)		.084	.068	.023	.053	.187	.699
	N	36	36	36	36	36	36	36
PLBPM_PreSL	Pearson Correlation	-.292	1	.974	.899	.892	.957	.002
	Sig. (2-tailed)	.084		.000	.000	.000	.000	.989
	N	36	36	36	36	36	36	36
PLBPM_8k	Pearson Correlation	-.307	.974	1	.943	.935	.943	-.038
	Sig. (2-tailed)	.068	.000		.000	.000	.000	.827
	N	36	36	36	36	36	36	36
PLBPM_12k	Pearson Correlation	-.378	.899	.943	1	.981	.892	-.082
	Sig. (2-tailed)	.023	.000	.000		.000	.000	.636
	N	36	36	36	36	36	36	36
PLBPM_14k	Pearson Correlation	-.326	.892	.935	.981	1	.899	-.063
	Sig. (2-tailed)	.053	.000	.000	.000		.000	.716
	N	36	36	36	36	36	36	36
PLBPM_PostSL	Pearson Correlation	-.225	.957	.943	.892	.899	1	.003
	Sig. (2-tailed)	.187	.000	.000	.000	.000		.985
	N	36	36	36	36	36	36	36
FITD_PreSL	Pearson Correlation	.067	.002	-.038	-.082	-.063	.003	1
	Sig. (2-tailed)	.699	.989	.827	.636	.716	.985	
	N	36	36	36	36	36	36	36
FITD_8k	Pearson Correlation	.056	.028	.000	-.051	-.028	.037	.960
	Sig. (2-tailed)	.747	.873	.999	.768	.873	.830	.000
	N	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITD_8k	FITD_12k	FITD_14k	FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k
OX_PostSL	Pearson Correlation	.056	.030	.058	.107	.107	.018	-.082	-.029
	Sig. (2-tailed)	.747	.868	.742	.546	.535	.918	.643	.868
	N	36	34	35	34	36	36	34	35
PLBPM_PreSL	Pearson Correlation	.028	.012	-.096	-.072	.092	.089	.090	.044
	Sig. (2-tailed)	.873	.946	.585	.686	.593	.606	.614	.803
	N	36	34	35	34	36	36	34	35
PLBPM_8k	Pearson Correlation	.000	-.009	-.118	-.108	.091	.055	.065	.033
	Sig. (2-tailed)	.999	.961	.501	.543	.598	.750	.715	.851
	N	36	34	35	34	36	36	34	35
PLBPM_12k	Pearson Correlation	-.051	-.025	-.191	-.171	-.028	-.071	.003	-.058
	Sig. (2-tailed)	.768	.888	.272	.333	.869	.679	.986	.740
	N	36	34	35	34	36	36	34	35
PLBPM_14k	Pearson Correlation	-.028	-.002	-.194	-.144	.041	-.002	.059	-.024
	Sig. (2-tailed)	.873	.990	.265	.415	.815	.990	.740	.893
	N	36	34	35	34	36	36	34	35
PLBPM_PostSL	Pearson Correlation	.037	.007	-.072	-.082	.087	.114	.125	.115
	Sig. (2-tailed)	.830	.970	.681	.645	.612	.508	.480	.511
	N	36	34	35	34	36	36	34	35
FITD_PreSL	Pearson Correlation	.960	.945	.920	.892	.363	.307	.361	.420
	Sig. (2-tailed)	.000	.000	.000	.000	.029	.068	.036	.012
	N	36	34	35	34	36	36	34	35
FITD_8k	Pearson Correlation	1	.966	.929	.906	.385	.349	.407	.472
	Sig. (2-tailed)		.000	.000	.000	.020	.037	.017	.004
	N	36	34	35	34	36	36	34	35

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITA_PostSL	FITL_PreSL	FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k
	Pearson Correlation	-.048	-.073	-.034	-.022	-.029	.169	-.037	.114
OX_PostSL	Sig. (2-tailed)	.786	.672	.845	.900	.869	.339	.832	.506
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.093	.104	.063	-.077	-.033	-.047	-.040	-.137
PLBPM_PreSL	Sig. (2-tailed)	.602	.546	.714	.665	.850	.793	.817	.427
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.109	.124	.123	-.025	.002	.003	-.014	-.123
PLBPM_8k	Sig. (2-tailed)	.540	.469	.473	.888	.990	.986	.937	.474
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.198	.154	.167	.020	.053	.040	-.076	-.202
PLBPM_12k	Sig. (2-tailed)	.263	.369	.332	.909	.760	.820	.658	.236
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.138	.093	.107	-.055	.004	-.010	-.075	-.216
PLBPM_14k	Sig. (2-tailed)	.435	.588	.533	.757	.980	.956	.665	.206
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.086	.105	.061	-.117	-.075	-.001	-.029	-.163
PLBPM_PostSL	Sig. (2-tailed)	.630	.542	.722	.512	.669	.993	.865	.343
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	.378	.281	.267	.220	.248	.262	.039	-.008
FITD_PreSL	Sig. (2-tailed)	.028	.097	.115	.212	.150	.134	.820	.962
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	.469	.252	.278	.196	.240	.220	.007	-.062
FITD_8k	Sig. (2-tailed)	.005	.138	.100	.266	.164	.212	.966	.718
	N	34	36	36	34	35	34	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITV_12k	FITV_14k	FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k
OX_PostSL	Pearson Correlation	.139	.244	.138	-.046	-.008	.034	.196
	Sig. (2-tailed)	.417	.151	.429	.792	.965	.846	.253
	N	36	36	35	36	36	36	36
PLBPM_PreSL	Pearson Correlation	-.054	-.152	-.053	.162	.110	.176	.042
	Sig. (2-tailed)	.753	.376	.761	.344	.524	.305	.806
	N	36	36	35	36	36	36	36
PLBPM_8k	Pearson Correlation	-.034	-.149	-.072	.159	.072	.155	.068
	Sig. (2-tailed)	.842	.386	.682	.355	.675	.366	.691
	N	36	36	35	36	36	36	36
PLBPM_12k	Pearson Correlation	-.125	-.251	-.154	.121	.035	.083	.012
	Sig. (2-tailed)	.467	.140	.376	.483	.839	.630	.947
	N	36	36	35	36	36	36	36
PLBPM_14k	Pearson Correlation	-.135	-.245	-.148	.091	.022	.096	.071
	Sig. (2-tailed)	.433	.151	.395	.596	.900	.579	.679
	N	36	36	35	36	36	36	36
PLBPM_PostSL	Pearson Correlation	-.066	-.154	-.094	.119	.068	.138	.078
	Sig. (2-tailed)	.700	.371	.590	.491	.694	.421	.649
	N	36	36	35	36	36	36	36
FITD_PreSL	Pearson Correlation	.001	.018	-.009	.107	.042	-.023	.066
	Sig. (2-tailed)	.995	.917	.959	.534	.808	.894	.702
	N	36	36	35	36	36	36	36
FITD_8k	Pearson Correlation	-.036	-.032	-.046	.083	.032	-.020	.060
	Sig. (2-tailed)	.837	.852	.791	.630	.855	.906	.726
	N	36	36	35	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		ESQams_PostSL
OX_PostSL	Pearson Correlation	.233
	Sig. (2-tailed)	.171
	N	36
PLBPM_PreSL	Pearson Correlation	-.133
	Sig. (2-tailed)	.441
	N	36
PLBPM_8k	Pearson Correlation	-.083
	Sig. (2-tailed)	.630
	N	36
PLBPM_12k	Pearson Correlation	-.077
	Sig. (2-tailed)	.655
	N	36
PLBPM_14k	Pearson Correlation	-.076
	Sig. (2-tailed)	.660
	N	36
PLBPM_PostSL	Pearson Correlation	-.135
	Sig. (2-tailed)	.433
	N	36
FITD_PreSL	Pearson Correlation	.056
	Sig. (2-tailed)	.747
	N	36
FITD_8k	Pearson Correlation	-.014
	Sig. (2-tailed)	.933
	N	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
	Pearson Correlation	-.054	-.213	-.084	-.234	-.188	-.133	-.082	-.054
FITD_12k	Sig. (2-tailed)	.761	.227	.637	.183	.288	.454	.645	.762
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	.079	-.234	-.123	-.278	-.352	-.158	-.158	.016
FITD_14k	Sig. (2-tailed)	.653	.175	.480	.106	.038	.365	.366	.929
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	-.016	-.263	-.123	-.264	-.297	-.192	-.206	-.001
FITD_PostSL	Sig. (2-tailed)	.930	.133	.490	.131	.088	.277	.241	.995
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	.212	-.304	.135	-.283	-.255	.048	-.209	-.293
FITA_PreSL	Sig. (2-tailed)	.214	.072	.432	.095	.134	.783	.221	.083
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.140	-.129	.142	-.251	-.268	-.077	-.064	-.261
FITA_8k	Sig. (2-tailed)	.417	.453	.410	.140	.113	.654	.713	.125
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.015	-.104	.058	-.258	-.301	-.112	.119	-.106
FITA_12k	Sig. (2-tailed)	.934	.558	.743	.141	.083	.528	.501	.550
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	.085	-.022	.050	-.232	-.238	-.151	.115	-.102
FITA_14k	Sig. (2-tailed)	.629	.901	.774	.180	.169	.387	.510	.559
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	-.058	-.101	-.085	-.214	-.324	-.105	-.028	-.138
FITA_PostSL	Sig. (2-tailed)	.743	.569	.632	.224	.062	.556	.876	.437
	N	34	34	34	34	34	34	34	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		BMI	MonthsPost_Inj	LOC	Amnesia	OX_PreSL	OX_8k	OX_12k	OX_14k
	Pearson Correlation	-.075	.332	.274	-.212	-.025	-.077	-.036	-.011
FITD_12k	Sig. (2-tailed)	.673	.055	.117	.230	.888	.667	.838	.951
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	-.137	.281	.070	-.270	.138	.061	.106	.122
FITD_14k	Sig. (2-tailed)	.433	.101	.689	.116	.429	.726	.546	.485
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	-.201	.266	.157	-.319	.096	.025	.030	-.034
FITD_PostSL	Sig. (2-tailed)	.255	.129	.376	.066	.589	.889	.865	.846
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	-.153	-.199	-.121	-.328	.203	.037	.063	.015
FITA_PreSL	Sig. (2-tailed)	.372	.244	.484	.050	.235	.830	.715	.929
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.015	-.185	.012	-.220	.211	.004	.029	-.049
FITA_8k	Sig. (2-tailed)	.931	.281	.943	.197	.217	.984	.866	.776
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.136	-.097	.082	-.313	.109	-.082	-.050	-.099
FITA_12k	Sig. (2-tailed)	.443	.583	.644	.071	.539	.644	.780	.578
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	.151	-.066	-.032	-.197	.181	.051	.100	.073
FITA_14k	Sig. (2-tailed)	.386	.706	.856	.256	.298	.769	.566	.676
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	-.016	-.062	-.071	-.249	.032	.011	.060	.004
FITA_PostSL	Sig. (2-tailed)	.927	.727	.691	.156	.856	.952	.736	.984
	N	34	34	34	34	34	34	34	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		OX_PostSL	PLBPM_PreSL	PLBPM_8k	PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL
FITD_12k	Pearson Correlation	.030	.012	-.009	-.025	-.002	.007	.945
	Sig. (2-tailed)	.868	.946	.961	.888	.990	.970	.000
	N	34	34	34	34	34	34	34
FITD_14k	Pearson Correlation	.058	-.096	-.118	-.191	-.194	-.072	.920
	Sig. (2-tailed)	.742	.585	.501	.272	.265	.681	.000
	N	35	35	35	35	35	35	35
FITD_PostSL	Pearson Correlation	.107	-.072	-.108	-.171	-.144	-.082	.892
	Sig. (2-tailed)	.546	.686	.543	.333	.415	.645	.000
	N	34	34	34	34	34	34	34
FITA_PreSL	Pearson Correlation	.107	.092	.091	-.028	.041	.087	.363
	Sig. (2-tailed)	.535	.593	.598	.869	.815	.612	.029
	N	36	36	36	36	36	36	36
FITA_8k	Pearson Correlation	.018	.089	.055	-.071	-.002	.114	.307
	Sig. (2-tailed)	.918	.606	.750	.679	.990	.508	.068
	N	36	36	36	36	36	36	36
FITA_12k	Pearson Correlation	-.082	.090	.065	.003	.059	.125	.361
	Sig. (2-tailed)	.643	.614	.715	.986	.740	.480	.036
	N	34	34	34	34	34	34	34
FITA_14k	Pearson Correlation	-.029	.044	.033	-.058	-.024	.115	.420
	Sig. (2-tailed)	.868	.803	.851	.740	.893	.511	.012
	N	35	35	35	35	35	35	35
FITA_PostSL	Pearson Correlation	-.048	-.093	-.109	-.198	-.138	-.086	.378
	Sig. (2-tailed)	.786	.602	.540	.263	.435	.630	.028
	N	34	34	34	34	34	34	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITD_8k	FITD_12k	FITD_14k	FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k
FITD_12k	Pearson Correlation	.966	1	.955	.919	.344	.326	.404	.457
	Sig. (2-tailed)	.000		.000	.000	.046	.060	.018	.007
	N	34	34	33	33	34	34	34	33
FITD_14k	Pearson Correlation	.929	.955	1	.936	.362	.422	.409	.549
	Sig. (2-tailed)	.000	.000		.000	.033	.011	.018	.001
	N	35	33	35	34	35	35	33	35
FITD_PostSL	Pearson Correlation	.906	.919	.936	1	.270	.353	.323	.374
	Sig. (2-tailed)	.000	.000	.000		.123	.041	.067	.029
	N	34	33	34	34	34	34	33	34
FITA_PreSL	Pearson Correlation	.385	.344	.362	.270	1	.872	.803	.726
	Sig. (2-tailed)	.020	.046	.033	.123		.000	.000	.000
	N	36	34	35	34	36	36	34	35
FITA_8k	Pearson Correlation	.349	.326	.422	.353	.872	1	.887	.860
	Sig. (2-tailed)	.037	.060	.011	.041	.000		.000	.000
	N	36	34	35	34	36	36	34	35
FITA_12k	Pearson Correlation	.407	.404	.409	.323	.803	.887	1	.931
	Sig. (2-tailed)	.017	.018	.018	.067	.000	.000		.000
	N	34	34	33	33	34	34	34	33
FITA_14k	Pearson Correlation	.472	.457	.549	.374	.726	.860	.931	1
	Sig. (2-tailed)	.004	.007	.001	.029	.000	.000	.000	
	N	35	33	35	34	35	35	33	35
FITA_PostSL	Pearson Correlation	.469	.466	.463	.468	.727	.866	.853	.839
	Sig. (2-tailed)	.005	.006	.006	.005	.000	.000	.000	.000
	N	34	33	34	34	34	34	33	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITA_PostSL	FITL_PreSL	FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k
	Pearson Correlation	.466	.158	.216	.191	.218	.159	-.035	-.081
FITD_12k	Sig. (2-tailed)	.006	.373	.221	.279	.224	.378	.846	.650
	N	33	34	34	34	33	33	34	34
	Pearson Correlation	.463	.317	.296	.298	.219	.288	.136	.114
FITD_14k	Sig. (2-tailed)	.006	.064	.085	.092	.207	.099	.437	.515
	N	34	35	35	33	35	34	35	35
	Pearson Correlation	.468	.249	.269	.232	.303	.237	.050	.013
FITD_PostSL	Sig. (2-tailed)	.005	.156	.124	.195	.081	.178	.778	.943
	N	34	34	34	33	34	34	34	34
	Pearson Correlation	.727	-.331	-.258	-.322	-.194	-.258	-.023	-.073
FITA_PreSL	Sig. (2-tailed)	.000	.048	.128	.063	.263	.140	.896	.674
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	.866	-.308	-.321	-.355	-.290	-.310	.031	-.046
FITA_8k	Sig. (2-tailed)	.000	.067	.056	.040	.091	.075	.860	.789
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	.853	-.256	-.249	-.346	-.203	-.235	.095	.021
FITA_12k	Sig. (2-tailed)	.000	.144	.155	.045	.257	.187	.594	.907
	N	33	34	34	34	33	33	34	34
	Pearson Correlation	.839	-.119	-.166	-.278	-.228	-.179	.150	.097
FITA_14k	Sig. (2-tailed)	.000	.497	.339	.117	.188	.310	.389	.579
	N	34	35	35	33	35	34	35	35
	Pearson Correlation	1	-.281	-.224	-.334	-.165	-.339	.077	-.006
FITA_PostSL	Sig. (2-tailed)		.107	.202	.058	.352	.050	.664	.974
	N	34	34	34	33	34	34	34	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITV_12k	FITV_14k	FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k
FITD_12k	Pearson Correlation	-.083	-.048	-.061	.008	.060	-.027	.025
	Sig. (2-tailed)	.640	.786	.733	.966	.736	.879	.887
	N	34	34	34	34	34	34	34
FITD_14k	Pearson Correlation	.146	.167	.057	.173	.149	.079	.152
	Sig. (2-tailed)	.403	.336	.748	.319	.392	.652	.384
	N	35	35	34	35	35	35	35
FITD_PostSL	Pearson Correlation	.073	.081	.119	.088	.080	.030	.172
	Sig. (2-tailed)	.680	.648	.503	.622	.653	.864	.330
	N	34	34	34	34	34	34	34
FITA_PreSL	Pearson Correlation	-.052	-.053	-.086	-.140	-.107	-.080	-.103
	Sig. (2-tailed)	.764	.760	.622	.416	.533	.641	.549
	N	36	36	35	36	36	36	36
FITA_8k	Pearson Correlation	.002	.037	.012	-.243	-.191	-.106	-.148
	Sig. (2-tailed)	.990	.832	.946	.153	.265	.539	.389
	N	36	36	35	36	36	36	36
FITA_12k	Pearson Correlation	.046	.005	.000	-.220	-.197	-.173	-.236
	Sig. (2-tailed)	.798	.978	.999	.211	.265	.328	.179
	N	34	34	34	34	34	34	34
FITA_14k	Pearson Correlation	.106	.141	-.038	-.073	-.043	-.013	-.092
	Sig. (2-tailed)	.545	.420	.830	.676	.805	.939	.601
	N	35	35	34	35	35	35	35
FITA_PostSL	Pearson Correlation	.060	.056	.063	-.170	-.152	-.121	-.151
	Sig. (2-tailed)	.735	.751	.725	.337	.391	.496	.395
	N	34	34	34	34	34	34	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		ESQams_PostSL
FITD_12k	Pearson Correlation	-.071
	Sig. (2-tailed)	.689
	N	34
FITD_14k	Pearson Correlation	.088
	Sig. (2-tailed)	.614
	N	35
FITD_PostSL	Pearson Correlation	.003
	Sig. (2-tailed)	.988
	N	34
FITA_PreSL	Pearson Correlation	-.057
	Sig. (2-tailed)	.739
	N	36
FITA_8k	Pearson Correlation	-.135
	Sig. (2-tailed)	.433
	N	36
FITA_12k	Pearson Correlation	-.148
	Sig. (2-tailed)	.402
	N	34
FITA_14k	Pearson Correlation	-.028
	Sig. (2-tailed)	.874
	N	35
FITA_PostSL	Pearson Correlation	-.221
	Sig. (2-tailed)	.210
	N	34

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
FITL_PreSL	Pearson Correlation	.115	.143	.093	-.061	-.064	.101	.178	.217
	Sig. (2-tailed)	.505	.405	.591	.724	.713	.557	.298	.203
	N	36	36	36	36	36	36	36	36
FITL_8k	Pearson Correlation	.064	.102	.024	-.060	-.032	.229	.084	.241
	Sig. (2-tailed)	.712	.555	.888	.730	.852	.180	.627	.157
	N	36	36	36	36	36	36	36	36
FITL_12k	Pearson Correlation	.000	.134	-.088	-.132	-.058	.280	.008	.207
	Sig. (2-tailed)	.999	.449	.620	.458	.746	.109	.965	.240
	N	34	34	34	34	34	34	34	34
FITL_14k	Pearson Correlation	.138	.088	-.021	-.214	-.156	.281	-.030	.099
	Sig. (2-tailed)	.428	.615	.903	.216	.370	.103	.864	.571
	N	35	35	35	35	35	35	35	35
FITL_PostSL	Pearson Correlation	.225	-.017	-.077	-.208	-.071	.174	.034	.149
	Sig. (2-tailed)	.200	.923	.663	.237	.688	.326	.849	.400
	N	34	34	34	34	34	34	34	34
FITV_PreSL	Pearson Correlation	-.108	-.095	-.152	.174	-.092	-.216	.241	.239
	Sig. (2-tailed)	.531	.581	.378	.310	.592	.206	.156	.160
	N	36	36	36	36	36	36	36	36
FITV_8k	Pearson Correlation	-.111	-.173	-.206	.177	-.154	-.259	.140	.273
	Sig. (2-tailed)	.520	.314	.229	.303	.371	.127	.415	.108
	N	36	36	36	36	36	36	36	36
FITV_12k	Pearson Correlation	-.041	.001	-.125	.177	-.107	-.192	.231	.237
	Sig. (2-tailed)	.812	.996	.467	.303	.536	.262	.176	.164
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		BMI	MonthsPost_Inj	LOC	Amnesia	OX_PreSL	OX_8k	OX_12k	OX_14k
FITL_PreSL	Pearson Correlation	.179	.174	.021	.095	-.200	-.121	-.096	-.016
	Sig. (2-tailed)	.296	.311	.903	.580	.241	.483	.578	.926
	N	36	36	36	36	36	36	36	36
FITL_8k	Pearson Correlation	.044	.169	-.019	.089	-.207	-.098	-.038	.024
	Sig. (2-tailed)	.797	.324	.911	.608	.225	.571	.824	.888
	N	36	36	36	36	36	36	36	36
FITL_12k	Pearson Correlation	-.023	.208	.072	.122	-.098	-.007	.081	.131
	Sig. (2-tailed)	.898	.237	.686	.492	.580	.970	.648	.459
	N	34	34	34	34	34	34	34	34
FITL_14k	Pearson Correlation	-.013	.167	.030	-.018	-.189	-.055	-.013	.009
	Sig. (2-tailed)	.940	.338	.866	.920	.276	.753	.939	.959
	N	35	35	35	35	35	35	35	35
FITL_PostSL	Pearson Correlation	.062	.222	.071	-.109	.140	.154	.176	.163
	Sig. (2-tailed)	.726	.207	.690	.538	.429	.385	.319	.358
	N	34	34	34	34	34	34	34	34
FITV_PreSL	Pearson Correlation	.184	.321	-.045	-.040	.233	.067	.079	.113
	Sig. (2-tailed)	.284	.056	.796	.819	.171	.698	.646	.512
	N	36	36	36	36	36	36	36	36
FITV_8k	Pearson Correlation	.048	.211	-.114	-.211	.235	.156	.094	.138
	Sig. (2-tailed)	.783	.217	.507	.216	.168	.363	.587	.422
	N	36	36	36	36	36	36	36	36
FITV_12k	Pearson Correlation	.181	.390	-.228	-.288	.153	.205	.190	.247
	Sig. (2-tailed)	.289	.019	.182	.089	.374	.230	.266	.146
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		OX_PostSL	PLBPM_PreSL	PLBPM_8k	PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL
FITL_PreSL	Pearson Correlation	-.073	.104	.124	.154	.093	.105	.281
	Sig. (2-tailed)	.672	.546	.469	.369	.588	.542	.097
	N	36	36	36	36	36	36	36
FITL_8k	Pearson Correlation	-.034	.063	.123	.167	.107	.061	.267
	Sig. (2-tailed)	.845	.714	.473	.332	.533	.722	.115
	N	36	36	36	36	36	36	36
FITL_12k	Pearson Correlation	-.022	-.077	-.025	.020	-.055	-.117	.220
	Sig. (2-tailed)	.900	.665	.888	.909	.757	.512	.212
	N	34	34	34	34	34	34	34
FITL_14k	Pearson Correlation	-.029	-.033	.002	.053	.004	-.075	.248
	Sig. (2-tailed)	.869	.850	.990	.760	.980	.669	.150
	N	35	35	35	35	35	35	35
FITL_PostSL	Pearson Correlation	.169	-.047	.003	.040	-.010	-.001	.262
	Sig. (2-tailed)	.339	.793	.986	.820	.956	.993	.134
	N	34	34	34	34	34	34	34
FITV_PreSL	Pearson Correlation	-.037	-.040	-.014	-.076	-.075	-.029	.039
	Sig. (2-tailed)	.832	.817	.937	.658	.665	.865	.820
	N	36	36	36	36	36	36	36
FITV_8k	Pearson Correlation	.114	-.137	-.123	-.202	-.216	-.163	-.008
	Sig. (2-tailed)	.506	.427	.474	.236	.206	.343	.962
	N	36	36	36	36	36	36	36
FITV_12k	Pearson Correlation	.139	-.054	-.034	-.125	-.135	-.066	.001
	Sig. (2-tailed)	.417	.753	.842	.467	.433	.700	.995
	N	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITD_8k	FITD_12k	FITD_14k	FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k
	Pearson Correlation	.252	.158	.317	.249	-.331	-.308	-.256	-.119
FITL_PreSL	Sig. (2-tailed)	.138	.373	.064	.156	.048	.067	.144	.497
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.278	.216	.296	.269	-.258	-.321	-.249	-.166
FITL_8k	Sig. (2-tailed)	.100	.221	.085	.124	.128	.056	.155	.339
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	.196	.191	.298	.232	-.322	-.355	-.346	-.278
FITL_12k	Sig. (2-tailed)	.266	.279	.092	.195	.063	.040	.045	.117
	N	34	34	33	33	34	34	34	33
	Pearson Correlation	.240	.218	.219	.303	-.194	-.290	-.203	-.228
FITL_14k	Sig. (2-tailed)	.164	.224	.207	.081	.263	.091	.257	.188
	N	35	33	35	34	35	35	33	35
	Pearson Correlation	.220	.159	.288	.237	-.258	-.310	-.235	-.179
FITL_PostSL	Sig. (2-tailed)	.212	.378	.099	.178	.140	.075	.187	.310
	N	34	33	34	34	34	34	33	34
	Pearson Correlation	.007	-.035	.136	.050	-.023	.031	.095	.150
FITV_PreSL	Sig. (2-tailed)	.966	.846	.437	.778	.896	.860	.594	.389
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.062	-.081	.114	.013	-.073	-.046	.021	.097
FITV_8k	Sig. (2-tailed)	.718	.650	.515	.943	.674	.789	.907	.579
	N	36	34	35	34	36	36	34	35
	Pearson Correlation	-.036	-.083	.146	.073	-.052	.002	.046	.106
FITV_12k	Sig. (2-tailed)	.837	.640	.403	.680	.764	.990	.798	.545
	N	36	34	35	34	36	36	34	35

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITA_PostSL	FITL_PreSL	FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k
	Pearson Correlation	-.281	1	.922	.843	.825	.809	.013	.027
FITL_PreSL	Sig. (2-tailed)	.107		.000	.000	.000	.000	.941	.875
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.224	.922	1	.879	.865	.812	.013	.041
FITL_8k	Sig. (2-tailed)	.202	.000		.000	.000	.000	.938	.811
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.334	.843	.879	1	.856	.867	-.097	-.017
FITL_12k	Sig. (2-tailed)	.058	.000	.000		.000	.000	.586	.923
	N	33	34	34	34	33	33	34	34
	Pearson Correlation	-.165	.825	.865	.856	1	.842	-.193	-.166
FITL_14k	Sig. (2-tailed)	.352	.000	.000	.000		.000	.268	.340
	N	34	35	35	33	35	34	35	35
	Pearson Correlation	-.339	.809	.812	.867	.842	1	-.070	-.008
FITL_PostSL	Sig. (2-tailed)	.050	.000	.000	.000	.000		.693	.966
	N	34	34	34	33	34	34	34	34
	Pearson Correlation	.077	.013	.013	-.097	-.193	-.070	1	.858
FITV_PreSL	Sig. (2-tailed)	.664	.941	.938	.586	.268	.693		.000
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.006	.027	.041	-.017	-.166	-.008	.858	1
FITV_8k	Sig. (2-tailed)	.974	.875	.811	.923	.340	.966	.000	
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	.060	.140	.122	.042	-.002	.096	.779	.874
FITV_12k	Sig. (2-tailed)	.735	.417	.479	.815	.990	.591	.000	.000
	N	34	36	36	34	35	34	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITV_12k	FITV_14k	FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k
FITL_PreSL	Pearson Correlation	.140	-.064	-.086	.488	.202	.168	.174
	Sig. (2-tailed)	.417	.710	.621	.003	.237	.329	.309
	N	36	36	35	36	36	36	36
FITL_8k	Pearson Correlation	.122	-.083	-.104	.373	.095	.054	.130
	Sig. (2-tailed)	.479	.630	.551	.025	.583	.754	.451
	N	36	36	35	36	36	36	36
FITL_12k	Pearson Correlation	.042	-.095	-.074	.224	.040	-.004	.058
	Sig. (2-tailed)	.815	.592	.677	.203	.822	.982	.746
	N	34	34	34	34	34	34	34
FITL_14k	Pearson Correlation	-.002	-.287	-.119	.365	.107	-.003	.022
	Sig. (2-tailed)	.990	.094	.504	.031	.541	.988	.898
	N	35	35	34	35	35	35	35
FITL_PostSL	Pearson Correlation	.096	-.090	-.045	.213	-.027	-.069	.095
	Sig. (2-tailed)	.591	.614	.799	.227	.879	.698	.591
	N	34	34	34	34	34	34	34
FITV_PreSL	Pearson Correlation	.779	.788	.726	-.006	-.059	-.025	.051
	Sig. (2-tailed)	.000	.000	.000	.974	.731	.885	.767
	N	36	36	35	36	36	36	36
FITV_8k	Pearson Correlation	.874	.908	.766	-.014	.003	.046	.094
	Sig. (2-tailed)	.000	.000	.000	.935	.985	.788	.586
	N	36	36	35	36	36	36	36
FITV_12k	Pearson Correlation	1	.851	.777	.039	-.045	.002	.123
	Sig. (2-tailed)		.000	.000	.822	.794	.989	.476
	N	36	36	35	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		ESQams_PostSL
FITL_PreSL	Pearson Correlation	.280
	Sig. (2-tailed)	.098
	N	36
FITL_8k	Pearson Correlation	.201
	Sig. (2-tailed)	.240
	N	36
FITL_12k	Pearson Correlation	.209
	Sig. (2-tailed)	.235
	N	34
FITL_14k	Pearson Correlation	.179
	Sig. (2-tailed)	.303
	N	35
FITL_PostSL	Pearson Correlation	.314
	Sig. (2-tailed)	.071
	N	34
FITV_PreSL	Pearson Correlation	.133
	Sig. (2-tailed)	.439
	N	36
FITV_8k	Pearson Correlation	.220
	Sig. (2-tailed)	.196
	N	36
FITV_12k	Pearson Correlation	.234
	Sig. (2-tailed)	.170
	N	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
FITV_14k	Pearson Correlation	-.047	-.157	-.221	.215	-.068	-.356	.089	.193
	Sig. (2-tailed)	.786	.360	.195	.207	.695	.033	.606	.260
	N	36	36	36	36	36	36	36	36
FITV_PostSL	Pearson Correlation	-.012	-.080	-.081	.232	-.011	-.217	.126	.108
	Sig. (2-tailed)	.946	.647	.643	.181	.949	.211	.471	.538
	N	35	35	35	35	35	35	35	35
ESQams_PreSL	Pearson Correlation	.336	-.054	.109	-.064	.026	.135	.015	-.183
	Sig. (2-tailed)	.045	.756	.525	.709	.879	.431	.932	.286
	N	36	36	36	36	36	36	36	36
ESQams_8k	Pearson Correlation	.294	-.160	.102	-.230	-.088	-.068	-.161	-.283
	Sig. (2-tailed)	.082	.350	.554	.177	.611	.696	.347	.095
	N	36	36	36	36	36	36	36	36
ESQams_12k	Pearson Correlation	.341	-.075	.245	-.132	.069	-.110	-.082	-.387
	Sig. (2-tailed)	.042	.663	.150	.442	.691	.523	.635	.020
	N	36	36	36	36	36	36	36	36
ESQams_14k	Pearson Correlation	.300	-.173	.109	-.094	.126	-.224	-.114	-.346
	Sig. (2-tailed)	.076	.313	.527	.584	.463	.190	.510	.039
	N	36	36	36	36	36	36	36	36
ESQams_PostSL	Pearson Correlation	.249	-.203	.009	-.267	-.178	-.225	-.111	-.212
	Sig. (2-tailed)	.143	.234	.959	.115	.300	.186	.520	.213
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		BMI	MonthsPost_Inj	LOC	Amnesia	OX_PreSL	OX_8k	OX_12k	OX_14k
FITV_14k	Pearson Correlation	.011	.267	-.101	-.160	.326	.307	.204	.232
	Sig. (2-tailed)	.950	.115	.556	.351	.052	.069	.234	.173
	N	36	36	36	36	36	36	36	36
FITV_PostSL	Pearson Correlation	.088	.292	-.036	-.184	.340	.321	.260	.298
	Sig. (2-tailed)	.613	.088	.839	.289	.046	.060	.132	.082
	N	35	35	35	35	35	35	35	35
ESQams_PreSL	Pearson Correlation	.135	.120	-.225	.153	-.187	-.003	-.171	-.046
	Sig. (2-tailed)	.434	.487	.188	.374	.274	.988	.318	.789
	N	36	36	36	36	36	36	36	36
ESQams_8k	Pearson Correlation	-.069	-.041	-.175	.118	-.199	-.115	-.315	-.228
	Sig. (2-tailed)	.688	.814	.307	.493	.245	.505	.061	.180
	N	36	36	36	36	36	36	36	36
ESQams_12k	Pearson Correlation	.050	-.038	-.226	.096	-.162	-.153	-.330	-.290
	Sig. (2-tailed)	.774	.824	.185	.578	.344	.373	.049	.086
	N	36	36	36	36	36	36	36	36
ESQams_14k	Pearson Correlation	.044	.118	-.216	-.140	-.022	-.134	-.206	-.270
	Sig. (2-tailed)	.798	.495	.206	.414	.900	.436	.229	.111
	N	36	36	36	36	36	36	36	36
ESQams_PostSL	Pearson Correlation	.022	.119	-.205	-.141	.089	-.202	-.294	-.304
	Sig. (2-tailed)	.900	.488	.231	.413	.608	.237	.082	.072
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		OX_PostSL	PLBPM_PreSL	PLBPM_8k	PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL
FITV_14k	Pearson Correlation	.244	-.152	-.149	-.251	-.245	-.154	.018
	Sig. (2-tailed)	.151	.376	.386	.140	.151	.371	.917
	N	36	36	36	36	36	36	36
FITV_PostSL	Pearson Correlation	.138	-.053	-.072	-.154	-.148	-.094	-.009
	Sig. (2-tailed)	.429	.761	.682	.376	.395	.590	.959
	N	35	35	35	35	35	35	35
ESQams_PreSL	Pearson Correlation	-.046	.162	.159	.121	.091	.119	.107
	Sig. (2-tailed)	.792	.344	.355	.483	.596	.491	.534
	N	36	36	36	36	36	36	36
ESQams_8k	Pearson Correlation	-.008	.110	.072	.035	.022	.068	.042
	Sig. (2-tailed)	.965	.524	.675	.839	.900	.694	.808
	N	36	36	36	36	36	36	36
ESQams_12k	Pearson Correlation	.034	.176	.155	.083	.096	.138	-.023
	Sig. (2-tailed)	.846	.305	.366	.630	.579	.421	.894
	N	36	36	36	36	36	36	36
ESQams_14k	Pearson Correlation	.196	.042	.068	.012	.071	.078	.066
	Sig. (2-tailed)	.253	.806	.691	.947	.679	.649	.702
	N	36	36	36	36	36	36	36
ESQams_PostSL	Pearson Correlation	.233	-.133	-.083	-.077	-.076	-.135	.056
	Sig. (2-tailed)	.171	.441	.630	.655	.660	.433	.747
	N	36	36	36	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITD_8k	FITD_12k	FITD_14k	FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k
FITV_14k	Pearson Correlation	-.032	-.048	.167	.081	-.053	.037	.005	.141
	Sig. (2-tailed)	.852	.786	.336	.648	.760	.832	.978	.420
	N	36	34	35	34	36	36	34	35
FITV_PostSL	Pearson Correlation	-.046	-.061	.057	.119	-.086	.012	.000	-.038
	Sig. (2-tailed)	.791	.733	.748	.503	.622	.946	.999	.830
	N	35	34	34	34	35	35	34	34
ESQams_PreSL	Pearson Correlation	.083	.008	.173	.088	-.140	-.243	-.220	-.073
	Sig. (2-tailed)	.630	.966	.319	.622	.416	.153	.211	.676
	N	36	34	35	34	36	36	34	35
ESQams_8k	Pearson Correlation	.032	.060	.149	.080	-.107	-.191	-.197	-.043
	Sig. (2-tailed)	.855	.736	.392	.653	.533	.265	.265	.805
	N	36	34	35	34	36	36	34	35
ESQams_12k	Pearson Correlation	-.020	-.027	.079	.030	-.080	-.106	-.173	-.013
	Sig. (2-tailed)	.906	.879	.652	.864	.641	.539	.328	.939
	N	36	34	35	34	36	36	34	35
ESQams_14k	Pearson Correlation	.060	.025	.152	.172	-.103	-.148	-.236	-.092
	Sig. (2-tailed)	.726	.887	.384	.330	.549	.389	.179	.601
	N	36	34	35	34	36	36	34	35
ESQams_PostSL	Pearson Correlation	-.014	-.071	.088	.003	-.057	-.135	-.148	-.028
	Sig. (2-tailed)	.933	.689	.614	.988	.739	.433	.402	.874
	N	36	34	35	34	36	36	34	35

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITA_PostSL	FITL_PreSL	FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k
	Pearson Correlation	.056	-.064	-.083	-.095	-.287	-.090	.788	.908
FITV_14k	Sig. (2-tailed)	.751	.710	.630	.592	.094	.614	.000	.000
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	.063	-.086	-.104	-.074	-.119	-.045	.726	.766
FITV_PostSL	Sig. (2-tailed)	.725	.621	.551	.677	.504	.799	.000	.000
	N	34	35	35	34	34	34	35	35
	Pearson Correlation	-.170	.488	.373	.224	.365	.213	-.006	-.014
ESQams_PreSL	Sig. (2-tailed)	.337	.003	.025	.203	.031	.227	.974	.935
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.152	.202	.095	.040	.107	-.027	-.059	.003
ESQams_8k	Sig. (2-tailed)	.391	.237	.583	.822	.541	.879	.731	.985
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.121	.168	.054	-.004	-.003	-.069	-.025	.046
ESQams_12k	Sig. (2-tailed)	.496	.329	.754	.982	.988	.698	.885	.788
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.151	.174	.130	.058	.022	.095	.051	.094
ESQams_14k	Sig. (2-tailed)	.395	.309	.451	.746	.898	.591	.767	.586
	N	34	36	36	34	35	34	36	36
	Pearson Correlation	-.221	.280	.201	.209	.179	.314	.133	.220
ESQams_PostSL	Sig. (2-tailed)	.210	.098	.240	.235	.303	.071	.439	.196
	N	34	36	36	34	35	34	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		FITV_12k	FITV_14k	FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k
FITV_14k	Pearson Correlation	.851	1	.852	-.058	.005	.077	.120
	Sig. (2-tailed)	.000		.000	.735	.977	.653	.487
	N	36	36	35	36	36	36	36
FITV_PostSL	Pearson Correlation	.777	.852	1	-.037	-.052	-.007	.021
	Sig. (2-tailed)	.000	.000		.833	.768	.968	.905
	N	35	35	35	35	35	35	35
ESQams_PreSL	Pearson Correlation	.039	-.058	-.037	1	.788	.740	.490
	Sig. (2-tailed)	.822	.735	.833		.000	.000	.002
	N	36	36	35	36	36	36	36
ESQams_8k	Pearson Correlation	-.045	.005	-.052	.788	1	.880	.567
	Sig. (2-tailed)	.794	.977	.768	.000		.000	.000
	N	36	36	35	36	36	36	36
ESQams_12k	Pearson Correlation	.002	.077	-.007	.740	.880	1	.759
	Sig. (2-tailed)	.989	.653	.968	.000	.000		.000
	N	36	36	35	36	36	36	36
ESQams_14k	Pearson Correlation	.123	.120	.021	.490	.567	.759	1
	Sig. (2-tailed)	.476	.487	.905	.002	.000	.000	
	N	36	36	35	36	36	36	36
ESQams_PostSL	Pearson Correlation	.234	.143	-.015	.256	.222	.385	.601
	Sig. (2-tailed)	.170	.406	.933	.133	.193	.020	.000
	N	36	36	35	36	36	36	36

Correlation matrix among all variables for the mild traumatic brain injury subjects, continued.

		ESQams_PostSL
FITV_14k	Pearson Correlation	.143
	Sig. (2-tailed)	.406
	N	36
FITV_PostSL	Pearson Correlation	-.015
	Sig. (2-tailed)	.933
	N	35
ESQams_PreSL	Pearson Correlation	.256
	Sig. (2-tailed)	.133
	N	36
ESQams_8k	Pearson Correlation	.222
	Sig. (2-tailed)	.193
	N	36
ESQams_12k	Pearson Correlation	.385
	Sig. (2-tailed)	.020
	N	36
ESQams_14k	Pearson Correlation	.601
	Sig. (2-tailed)	.000
	N	36
ESQams_PostSL	Pearson Correlation	1
	Sig. (2-tailed)	
	N	36

Appendix H. Correlation Matrix Among All Variables for the Control Subjects.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
	Pearson Correlation	-.303	1	.313	.347	.436	-.005	.164	-.108
Age	Sig. (2-tailed)	.073		.063	.038	.008	.977	.340	.532
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.181	.313	1	.140	.194	.276	.262	-.223
Pulse	Sig. (2-tailed)	.292	.063		.414	.257	.103	.123	.192
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.541	.347	.140	1	.690	-.078	.528	.107
BPsystolic	Sig. (2-tailed)	.001	.038	.414		.000	.652	.001	.536
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.270	.436	.194	.690	1	.027	.529	-.125
BPDiastolic	Sig. (2-tailed)	.112	.008	.257	.000		.876	.001	.467
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.193	-.005	.276	-.078	.027	1	.234	-.232
Respiration	Sig. (2-tailed)	.258	.977	.103	.652	.876		.170	.173
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.266	.164	.262	.528	.529	.234	1	.035
Weight	Sig. (2-tailed)	.117	.340	.123	.001	.001	.170		.841
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.503	-.108	-.223	.107	-.125	-.232	.035	1
Height_inches	Sig. (2-tailed)	.002	.532	.192	.536	.467	.173	.841	
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		BMI	OX_PreSL	OX_8k	OX_12k	OX_14k	OX_PostSL	PLBPM_PreSL	PLBPM_8k
	Pearson Correlation	-.135	.352	.170	-.017	-.153	.403	.073	.053
Sex	Sig. (2-tailed)	.433	.035	.321	.922	.374	.015	.672	.757
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.288	-.314	-.223	.047	.131	-.391	.290	.287
Age	Sig. (2-tailed)	.089	.062	.191	.786	.445	.018	.087	.090
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.303	-.109	-.032	.112	.066	-.022	.907	.889
Pulse	Sig. (2-tailed)	.073	.528	.854	.516	.701	.899	.000	.000
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.514	.070	-.185	-.001	.052	-.092	.294	.333
BPsystolic	Sig. (2-tailed)	.001	.687	.281	.994	.763	.593	.082	.047
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.579	.160	-.137	.135	.203	-.063	.301	.353
BPDiastolic	Sig. (2-tailed)	.000	.350	.425	.433	.236	.717	.074	.034
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.175	-.135	-.070	-.264	-.121	-.244	.233	.238
Respiration	Sig. (2-tailed)	.307	.433	.685	.120	.481	.152	.171	.163
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.893	-.129	-.463	-.344	-.198	-.232	.353	.404
Weight	Sig. (2-tailed)	.000	.453	.004	.040	.248	.172	.035	.014
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.320	-.289	-.173	.058	.154	-.176	-.186	-.207
Height_inches	Sig. (2-tailed)	.057	.087	.313	.738	.371	.305	.279	.225
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL	FITD_8k	FITD_12k	FITD_14k
Sex	Pearson Correlation	.063	.167	.135	.182	.253	.152	.236
	Sig. (2-tailed)	.714	.330	.433	.288	.137	.390	.172
	N	36	36	36	36	36	34	35
Age	Pearson Correlation	.244	.181	.214	-.430	-.357	-.338	-.302
	Sig. (2-tailed)	.151	.292	.211	.009	.032	.050	.078
	N	36	36	36	36	36	34	35
Pulse	Pearson Correlation	.835	.795	.865	.310	.336	.233	.382
	Sig. (2-tailed)	.000	.000	.000	.066	.045	.184	.023
	N	36	36	36	36	36	34	35
BPsystolic	Pearson Correlation	.310	.293	.295	-.114	-.072	-.126	-.201
	Sig. (2-tailed)	.065	.083	.081	.507	.677	.478	.248
	N	36	36	36	36	36	34	35
BPDiastolic	Pearson Correlation	.305	.331	.361	-.155	-.076	-.050	-.166
	Sig. (2-tailed)	.070	.049	.031	.367	.660	.777	.342
	N	36	36	36	36	36	34	35
Respiration	Pearson Correlation	.262	.262	.229	.063	.144	.130	.103
	Sig. (2-tailed)	.123	.123	.179	.713	.403	.465	.555
	N	36	36	36	36	36	34	35
Weight	Pearson Correlation	.435	.372	.413	-.137	-.133	-.226	-.267
	Sig. (2-tailed)	.008	.026	.012	.425	.440	.199	.121
	N	36	36	36	36	36	34	35
Height_inches	Pearson Correlation	-.228	-.341	-.240	.065	-.009	.154	.051
	Sig. (2-tailed)	.182	.042	.158	.705	.960	.385	.770
	N	36	36	36	36	36	34	35

Correlation matrix among all variables for the control subjects, continued.

		FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k	FITA_PostSL	FITL_PreSL
Sex	Pearson Correlation	.211	.213	.214	.280	.187	.227	-.017
	Sig. (2-tailed)	.230	.213	.210	.109	.281	.197	.920
	N	34	36	36	34	35	34	36
Age	Pearson Correlation	-.454	-.270	-.280	-.294	-.137	-.429	.187
	Sig. (2-tailed)	.007	.111	.098	.091	.432	.011	.276
	N	34	36	36	34	35	34	36
Pulse	Pearson Correlation	.178	.072	.078	.111	.215	-.182	.098
	Sig. (2-tailed)	.313	.678	.651	.531	.215	.302	.569
	N	34	36	36	34	35	34	36
BPsystolic	Pearson Correlation	-.176	-.122	-.116	-.105	-.227	-.241	-.009
	Sig. (2-tailed)	.320	.479	.500	.553	.190	.170	.957
	N	34	36	36	34	35	34	36
BPDiastolic	Pearson Correlation	-.204	-.139	-.019	-.048	-.117	-.267	.167
	Sig. (2-tailed)	.246	.420	.911	.790	.503	.128	.329
	N	34	36	36	34	35	34	36
Respiration	Pearson Correlation	.019	-.068	-.124	-.085	.022	-.007	.269
	Sig. (2-tailed)	.915	.692	.471	.634	.899	.970	.112
	N	34	36	36	34	35	34	36
Weight	Pearson Correlation	-.316	-.035	-.032	-.024	-.058	.004	.299
	Sig. (2-tailed)	.069	.838	.852	.892	.741	.981	.077
	N	34	36	36	34	35	34	36
Height_inches	Pearson Correlation	.086	.024	.038	.011	-.007	.118	-.019
	Sig. (2-tailed)	.628	.891	.824	.953	.969	.505	.913
	N	34	36	36	34	35	34	36

Correlation matrix among all variables for the control subjects, continued.

		FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k	FITV_12k	FITV_14k
Sex	Pearson Correlation	-.057	-.076	-.088	-.103	.067	.139	.159	.061
	Sig. (2-tailed)	.741	.668	.617	.562	.697	.419	.362	.724
	N	36	34	35	34	36	36	35	36
Age	Pearson Correlation	.249	.233	.123	.257	-.069	-.079	-.092	.098
	Sig. (2-tailed)	.143	.184	.481	.143	.688	.647	.598	.571
	N	36	34	35	34	36	36	35	36
Pulse	Pearson Correlation	.089	.023	-.039	.181	.093	.048	.098	.150
	Sig. (2-tailed)	.605	.899	.824	.305	.588	.782	.576	.384
	N	36	34	35	34	36	36	35	36
BPsystolic	Pearson Correlation	.021	-.023	-.040	.072	.292	.234	.224	.279
	Sig. (2-tailed)	.903	.898	.818	.687	.084	.169	.196	.099
	N	36	34	35	34	36	36	35	36
BPDiastolic	Pearson Correlation	.153	.157	.115	.279	.339	.252	.317	.303
	Sig. (2-tailed)	.373	.374	.509	.110	.043	.138	.064	.072
	N	36	34	35	34	36	36	35	36
Respiration	Pearson Correlation	.323	.320	.264	.173	.201	.008	.025	.190
	Sig. (2-tailed)	.055	.065	.125	.329	.240	.962	.885	.267
	N	36	34	35	34	36	36	35	36
Weight	Pearson Correlation	.226	.189	.199	.200	.270	.069	.150	.220
	Sig. (2-tailed)	.184	.284	.253	.257	.112	.690	.389	.197
	N	36	34	35	34	36	36	35	36
Height_inches	Pearson Correlation	-.005	.067	.103	-.089	-.326	-.235	-.284	-.302
	Sig. (2-tailed)	.977	.707	.555	.618	.052	.168	.098	.074
	N	36	34	35	34	36	36	35	36

Correlation matrix among all variables for the control subjects, continued.

		FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k	ESQams_PostSL
Sex	Pearson Correlation	.104	.618	.513	.511	.489	.510
	Sig. (2-tailed)	.547	.000	.001	.001	.002	.001
	N	36	36	36	36	36	36
Age	Pearson Correlation	-.185	-.260	-.417	-.350	-.347	-.182
	Sig. (2-tailed)	.280	.125	.011	.036	.038	.289
	N	36	36	36	36	36	36
Pulse	Pearson Correlation	-.028	-.044	-.122	-.136	-.074	-.141
	Sig. (2-tailed)	.873	.799	.478	.431	.669	.413
	N	36	36	36	36	36	36
BPsystolic	Pearson Correlation	.151	-.409	-.224	-.332	-.297	-.429
	Sig. (2-tailed)	.380	.013	.190	.048	.078	.009
	N	36	36	36	36	36	36
BPDiastolic	Pearson Correlation	.254	-.164	-.069	-.130	-.111	-.239
	Sig. (2-tailed)	.136	.340	.687	.449	.517	.160
	N	36	36	36	36	36	36
Respiration	Pearson Correlation	-.001	.245	.072	.170	.101	.224
	Sig. (2-tailed)	.996	.149	.677	.323	.557	.188
	N	36	36	36	36	36	36
Weight	Pearson Correlation	.058	-.162	-.186	-.241	-.293	-.278
	Sig. (2-tailed)	.737	.346	.277	.156	.083	.100
	N	36	36	36	36	36	36
Height_inches	Pearson Correlation	-.190	-.369	-.194	-.152	-.204	-.230
	Sig. (2-tailed)	.267	.027	.258	.378	.232	.178
	N	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
BMI	Pearson Correlation	-.135	.288	.303	.514	.579	.175	.893	-.320
	Sig. (2-tailed)	.433	.089	.073	.001	.000	.307	.000	.057
	N	36	36	36	36	36	36	36	36
OX_PreSL	Pearson Correlation	.352	-.314	-.109	.070	.160	-.135	-.129	-.289
	Sig. (2-tailed)	.035	.062	.528	.687	.350	.433	.453	.087
	N	36	36	36	36	36	36	36	36
OX_8k	Pearson Correlation	.170	-.223	-.032	-.185	-.137	-.070	-.463	-.173
	Sig. (2-tailed)	.321	.191	.854	.281	.425	.685	.004	.313
	N	36	36	36	36	36	36	36	36
OX_12k	Pearson Correlation	-.017	.047	.112	-.001	.135	-.264	-.344	.058
	Sig. (2-tailed)	.922	.786	.516	.994	.433	.120	.040	.738
	N	36	36	36	36	36	36	36	36
OX_14k	Pearson Correlation	-.153	.131	.066	.052	.203	-.121	-.198	.154
	Sig. (2-tailed)	.374	.445	.701	.763	.236	.481	.248	.371
	N	36	36	36	36	36	36	36	36
OX_PostSL	Pearson Correlation	.403	-.391	-.022	-.092	-.063	-.244	-.232	-.176
	Sig. (2-tailed)	.015	.018	.899	.593	.717	.152	.172	.305
	N	36	36	36	36	36	36	36	36
PLBPM_PreSL	Pearson Correlation	.073	.290	.907	.294	.301	.233	.353	-.186
	Sig. (2-tailed)	.672	.087	.000	.082	.074	.171	.035	.279
	N	36	36	36	36	36	36	36	36
PLBPM_8k	Pearson Correlation	.053	.287	.889	.333	.353	.238	.404	-.207
	Sig. (2-tailed)	.757	.090	.000	.047	.034	.163	.014	.225
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		BMI	OX_PreSL	OX_8k	OX_12k	OX_14k	OX_PostSL	PLBPM_PreSL	PLBPM_8k
BMI	Pearson Correlation	1	.002	-.363	-.345	-.210	-.193	.409	.460
	Sig. (2-tailed)		.993	.030	.039	.220	.260	.013	.005
	N	36	36	36	36	36	36	36	36
OX_PreSL	Pearson Correlation	.002	1	.480	.213	.154	.579	-.066	-.119
	Sig. (2-tailed)	.993		.003	.212	.369	.000	.700	.490
	N	36	36	36	36	36	36	36	36
OX_8k	Pearson Correlation	-.363	.480	1	.618	.651	.439	-.145	-.206
	Sig. (2-tailed)	.030	.003		.000	.000	.007	.398	.228
	N	36	36	36	36	36	36	36	36
OX_12k	Pearson Correlation	-.345	.213	.618	1	.668	.322	-.035	-.016
	Sig. (2-tailed)	.039	.212	.000		.000	.056	.838	.928
	N	36	36	36	36	36	36	36	36
OX_14k	Pearson Correlation	-.210	.154	.651	.668	1	.204	-.073	-.114
	Sig. (2-tailed)	.220	.369	.000	.000		.233	.673	.506
	N	36	36	36	36	36	36	36	36
OX_PostSL	Pearson Correlation	-.193	.579	.439	.322	.204	1	-.040	-.078
	Sig. (2-tailed)	.260	.000	.007	.056	.233		.819	.650
	N	36	36	36	36	36	36	36	36
PLBPM_PreSL	Pearson Correlation	.409	-.066	-.145	-.035	-.073	-.040	1	.963
	Sig. (2-tailed)	.013	.700	.398	.838	.673	.819		.000
	N	36	36	36	36	36	36	36	36
PLBPM_8k	Pearson Correlation	.460	-.119	-.206	-.016	-.114	-.078	.963	1
	Sig. (2-tailed)	.005	.490	.228	.928	.506	.650	.000	
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL	FITD_8k	FITD_12k	FITD_14k
	Pearson Correlation	.495	.464	.467	-.151	-.128	-.262	-.268
BMI	Sig. (2-tailed)	.002	.004	.004	.380	.457	.134	.119
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.139	-.052	-.051	.054	.093	.112	.045
OX_PreSL	Sig. (2-tailed)	.419	.763	.769	.755	.591	.528	.799
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.263	-.222	-.157	.175	.152	.196	.214
OX_8k	Sig. (2-tailed)	.122	.194	.362	.308	.377	.266	.217
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.090	-.062	.032	.049	.045	.133	.179
OX_12k	Sig. (2-tailed)	.603	.720	.854	.775	.793	.454	.304
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.240	-.247	-.035	-.050	-.012	.090	.168
OX_14k	Sig. (2-tailed)	.159	.147	.838	.773	.944	.613	.335
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.099	-.033	.017	.043	.014	.053	.095
OX_PostSL	Sig. (2-tailed)	.567	.850	.921	.804	.935	.765	.587
	N	36	36	36	36	36	34	35
	Pearson Correlation	.916	.894	.947	.379	.413	.359	.427
PLBPM_PreSL	Sig. (2-tailed)	.000	.000	.000	.023	.012	.037	.011
	N	36	36	36	36	36	34	35
	Pearson Correlation	.971	.943	.933	.373	.389	.304	.371
PLBPM_8k	Sig. (2-tailed)	.000	.000	.000	.025	.019	.080	.028
	N	36	36	36	36	36	34	35

Correlation matrix among all variables for the control subjects, continued.

		FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k	FITA_PostSL	FITL_PreSL
	Pearson Correlation	-.305	-.049	-.039	-.017	-.026	-.062	.239
BMI	Sig. (2-tailed)	.079	.778	.820	.925	.883	.730	.160
	N	34	36	36	34	35	34	36
	Pearson Correlation	.117	.020	.133	.113	.002	-.004	-.149
OX_PreSL	Sig. (2-tailed)	.510	.909	.441	.526	.993	.983	.385
	N	34	36	36	34	35	34	36
	Pearson Correlation	.255	.212	.245	.256	.335	.097	-.367
OX_8k	Sig. (2-tailed)	.146	.214	.149	.144	.049	.586	.028
	N	34	36	36	34	35	34	36
	Pearson Correlation	.031	.010	.049	.162	.143	-.186	-.280
OX_12k	Sig. (2-tailed)	.862	.953	.777	.360	.412	.293	.098
	N	34	36	36	34	35	34	36
	Pearson Correlation	.048	-.031	.093	.120	.267	.024	-.132
OX_14k	Sig. (2-tailed)	.786	.857	.591	.500	.121	.891	.444
	N	34	36	36	34	35	34	36
	Pearson Correlation	.084	.347	.313	.367	.250	.249	-.541
OX_PostSL	Sig. (2-tailed)	.637	.038	.063	.033	.148	.156	.001
	N	34	36	36	34	35	34	36
	Pearson Correlation	.295	.049	.114	.106	.121	-.206	.084
PLBPM_PreSL	Sig. (2-tailed)	.090	.775	.506	.550	.490	.242	.628
	N	34	36	36	34	35	34	36
	Pearson Correlation	.238	.044	.129	.130	.100	-.230	.092
PLBPM_8k	Sig. (2-tailed)	.176	.799	.452	.462	.568	.191	.592
	N	34	36	36	34	35	34	36

Correlation matrix among all variables for the control subjects, continued.

		FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k	FITV_12k	FITV_14k
BMI	Pearson Correlation	.192	.135	.114	.205	.302	.096	.201	.259
	Sig. (2-tailed)	.263	.445	.515	.244	.073	.576	.247	.127
	N	36	34	35	34	36	36	35	36
OX_PreSL	Pearson Correlation	-.173	-.192	-.206	-.062	.000	.119	.096	.006
	Sig. (2-tailed)	.312	.276	.235	.726	.998	.488	.583	.972
	N	36	34	35	34	36	36	35	36
OX_8k	Pearson Correlation	-.362	-.350	-.338	-.076	.104	.099	.124	.105
	Sig. (2-tailed)	.030	.043	.047	.668	.547	.566	.477	.543
	N	36	34	35	34	36	36	35	36
OX_12k	Pearson Correlation	-.309	-.355	-.240	-.073	.037	.180	.158	.181
	Sig. (2-tailed)	.066	.039	.165	.683	.830	.294	.366	.291
	N	36	34	35	34	36	36	35	36
OX_14k	Pearson Correlation	-.148	-.123	-.072	.029	.095	.077	.130	.123
	Sig. (2-tailed)	.389	.487	.680	.871	.582	.656	.457	.476
	N	36	34	35	34	36	36	35	36
OX_PostSL	Pearson Correlation	-.575	-.582	-.524	-.491	.084	.203	.089	.105
	Sig. (2-tailed)	.000	.000	.001	.003	.627	.235	.612	.542
	N	36	34	35	34	36	36	35	36
PLBPM_PreSL	Pearson Correlation	.059	.068	-.002	.213	.185	.137	.153	.151
	Sig. (2-tailed)	.730	.701	.993	.227	.281	.427	.381	.379
	N	36	34	35	34	36	36	35	36
PLBPM_8k	Pearson Correlation	.052	.066	.015	.230	.210	.164	.180	.206
	Sig. (2-tailed)	.761	.711	.934	.190	.219	.338	.302	.229
	N	36	34	35	34	36	36	35	36

Correlation matrix among all variables for the control subjects, continued.

		FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k	ESQams_PostSL
	Pearson Correlation	.044	-.060	-.149	-.219	-.245	-.200
BMI	Sig. (2-tailed)	.798	.727	.385	.200	.150	.241
	N	36	36	36	36	36	36
	Pearson Correlation	.036	.364	.436	.333	.359	.259
OX_PreSL	Sig. (2-tailed)	.833	.029	.008	.047	.031	.126
	N	36	36	36	36	36	36
	Pearson Correlation	.139	.165	.100	.129	.089	.230
OX_8k	Sig. (2-tailed)	.418	.335	.560	.453	.607	.177
	N	36	36	36	36	36	36
	Pearson Correlation	.292	.041	-.049	-.104	-.113	-.167
OX_12k	Sig. (2-tailed)	.084	.811	.778	.545	.511	.329
	N	36	36	36	36	36	36
	Pearson Correlation	.108	-.059	-.142	-.163	-.218	-.082
OX_14k	Sig. (2-tailed)	.532	.731	.410	.342	.201	.634
	N	36	36	36	36	36	36
	Pearson Correlation	.238	.123	.201	.158	.135	.080
OX_PostSL	Sig. (2-tailed)	.162	.474	.239	.356	.432	.642
	N	36	36	36	36	36	36
	Pearson Correlation	.020	-.127	-.155	-.152	-.073	-.229
PLBPM_PreSL	Sig. (2-tailed)	.908	.460	.367	.378	.673	.180
	N	36	36	36	36	36	36
	Pearson Correlation	.072	-.067	-.139	-.162	-.066	-.281
PLBPM_8k	Sig. (2-tailed)	.677	.698	.419	.346	.702	.097
	N	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
PLBPM_12k	Pearson Correlation	.063	.244	.835	.310	.305	.262	.435	-.228
	Sig. (2-tailed)	.714	.151	.000	.065	.070	.123	.008	.182
	N	36	36	36	36	36	36	36	36
PLBPM_14k	Pearson Correlation	.167	.181	.795	.293	.331	.262	.372	-.341
	Sig. (2-tailed)	.330	.292	.000	.083	.049	.123	.026	.042
	N	36	36	36	36	36	36	36	36
PLBPM_PostSL	Pearson Correlation	.135	.214	.865	.295	.361	.229	.413	-.240
	Sig. (2-tailed)	.433	.211	.000	.081	.031	.179	.012	.158
	N	36	36	36	36	36	36	36	36
FITD_PreSL	Pearson Correlation	.182	-.430	.310	-.114	-.155	.063	-.137	.065
	Sig. (2-tailed)	.288	.009	.066	.507	.367	.713	.425	.705
	N	36	36	36	36	36	36	36	36
FITD_8k	Pearson Correlation	.253	-.357	.336	-.072	-.076	.144	-.133	-.009
	Sig. (2-tailed)	.137	.032	.045	.677	.660	.403	.440	.960
	N	36	36	36	36	36	36	36	36
FITD_12k	Pearson Correlation	.152	-.338	.233	-.126	-.050	.130	-.226	.154
	Sig. (2-tailed)	.390	.050	.184	.478	.777	.465	.199	.385
	N	34	34	34	34	34	34	34	34
FITD_14k	Pearson Correlation	.236	-.302	.382	-.201	-.166	.103	-.267	.051
	Sig. (2-tailed)	.172	.078	.023	.248	.342	.555	.121	.770
	N	35	35	35	35	35	35	35	35
FITD_PostSL	Pearson Correlation	.211	-.454	.178	-.176	-.204	.019	-.316	.086
	Sig. (2-tailed)	.230	.007	.313	.320	.246	.915	.069	.628
	N	34	34	34	34	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		BMI	OX_PreSL	OX_8k	OX_12k	OX_14k	OX_PostSL	PLBPM_PreSL	PLBPM_8k
PLBPM_12k	Pearson Correlation	.495	-.139	-.263	-.090	-.240	-.099	.916	.971
	Sig. (2-tailed)	.002	.419	.122	.603	.159	.567	.000	.000
	N	36	36	36	36	36	36	36	36
PLBPM_14k	Pearson Correlation	.464	-.052	-.222	-.062	-.247	-.033	.894	.943
	Sig. (2-tailed)	.004	.763	.194	.720	.147	.850	.000	.000
	N	36	36	36	36	36	36	36	36
PLBPM_PostSL	Pearson Correlation	.467	-.051	-.157	.032	-.035	.017	.947	.933
	Sig. (2-tailed)	.004	.769	.362	.854	.838	.921	.000	.000
	N	36	36	36	36	36	36	36	36
FITD_PreSL	Pearson Correlation	-.151	.054	.175	.049	-.050	.043	.379	.373
	Sig. (2-tailed)	.380	.755	.308	.775	.773	.804	.023	.025
	N	36	36	36	36	36	36	36	36
FITD_8k	Pearson Correlation	-.128	.093	.152	.045	-.012	.014	.413	.389
	Sig. (2-tailed)	.457	.591	.377	.793	.944	.935	.012	.019
	N	36	36	36	36	36	36	36	36
FITD_12k	Pearson Correlation	-.262	.112	.196	.133	.090	.053	.359	.304
	Sig. (2-tailed)	.134	.528	.266	.454	.613	.765	.037	.080
	N	34	34	34	34	34	34	34	34
FITD_14k	Pearson Correlation	-.268	.045	.214	.179	.168	.095	.427	.371
	Sig. (2-tailed)	.119	.799	.217	.304	.335	.587	.011	.028
	N	35	35	35	35	35	35	35	35
FITD_PostSL	Pearson Correlation	-.305	.117	.255	.031	.048	.084	.295	.238
	Sig. (2-tailed)	.079	.510	.146	.862	.786	.637	.090	.176
	N	34	34	34	34	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL	FITD_8k	FITD_12k	FITD_14k
PLBPM_12k	Pearson Correlation	1	.967	.899	.363	.370	.280	.331
	Sig. (2-tailed)		.000	.000	.030	.026	.109	.052
	N	36	36	36	36	36	34	35
PLBPM_14k	Pearson Correlation	.967	1	.915	.398	.421	.303	.383
	Sig. (2-tailed)	.000		.000	.016	.011	.081	.023
	N	36	36	36	36	36	34	35
PLBPM_PostSL	Pearson Correlation	.899	.915	1	.340	.377	.279	.385
	Sig. (2-tailed)	.000	.000		.042	.023	.110	.022
	N	36	36	36	36	36	34	35
FITD_PreSL	Pearson Correlation	.363	.398	.340	1	.941	.944	.890
	Sig. (2-tailed)	.030	.016	.042		.000	.000	.000
	N	36	36	36	36	36	34	35
FITD_8k	Pearson Correlation	.370	.421	.377	.941	1	.959	.926
	Sig. (2-tailed)	.026	.011	.023	.000		.000	.000
	N	36	36	36	36	36	34	35
FITD_12k	Pearson Correlation	.280	.303	.279	.944	.959	1	.934
	Sig. (2-tailed)	.109	.081	.110	.000	.000		.000
	N	34	34	34	34	34	34	33
FITD_14k	Pearson Correlation	.331	.383	.385	.890	.926	.934	1
	Sig. (2-tailed)	.052	.023	.022	.000	.000	.000	
	N	35	35	35	35	35	33	35
FITD_PostSL	Pearson Correlation	.193	.257	.249	.921	.911	.938	.929
	Sig. (2-tailed)	.273	.142	.156	.000	.000	.000	.000
	N	34	34	34	34	34	32	33

Correlation matrix among all variables for the control subjects, continued.

		FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k	FITA_PostSL	FITL_PreSL
	Pearson Correlation	.193	.036	.085	.105	.049	-.252	.122
PLBPM_12k	Sig. (2-tailed)	.273	.834	.621	.554	.779	.150	.478
	N	34	36	36	34	35	34	36
	Pearson Correlation	.257	.009	.073	.088	.013	-.260	.105
PLBPM_14k	Sig. (2-tailed)	.142	.957	.673	.619	.942	.137	.544
	N	34	36	36	34	35	34	36
	Pearson Correlation	.249	.008	.086	.120	.076	-.186	.104
PLBPM_PostSL	Sig. (2-tailed)	.156	.964	.617	.500	.665	.291	.546
	N	34	36	36	34	35	34	36
	Pearson Correlation	.921	.119	.142	.113	.019	-.041	.131
FITD_PreSL	Sig. (2-tailed)	.000	.488	.408	.525	.913	.820	.447
	N	34	36	36	34	35	34	36
	Pearson Correlation	.911	.065	.142	.119	.047	-.039	.213
FITD_8k	Sig. (2-tailed)	.000	.707	.408	.504	.787	.827	.212
	N	34	36	36	34	35	34	36
	Pearson Correlation	.938	.028	.112	.061	.021	-.066	.193
FITD_12k	Sig. (2-tailed)	.000	.874	.529	.731	.907	.719	.274
	N	32	34	34	34	33	32	34
	Pearson Correlation	.929	-.001	.036	.030	.045	-.097	.116
FITD_14k	Sig. (2-tailed)	.000	.995	.835	.869	.797	.593	.508
	N	33	35	35	33	35	33	35
	Pearson Correlation	1	.005	.096	.023	-.039	-.034	.128
FITD_PostSL	Sig. (2-tailed)		.977	.590	.899	.831	.850	.470
	N	34	34	34	32	33	34	34

Correlation matrix among all variables for the control subjects, continued.

		FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k	FITV_12k	FITV_14k
	Pearson Correlation	.090	.086	.049	.242	.200	.133	.157	.209
PLBPM_12k	Sig. (2-tailed)	.602	.627	.780	.168	.241	.439	.369	.221
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	.059	.062	.041	.222	.257	.197	.242	.237
PLBPM_14k	Sig. (2-tailed)	.733	.728	.817	.207	.130	.248	.162	.165
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	.023	.032	-.001	.160	.270	.207	.238	.193
PLBPM_PostSL	Sig. (2-tailed)	.893	.858	.995	.367	.112	.226	.169	.259
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	.122	.202	.245	.274	.055	.085	.184	-.024
FITD_PreSL	Sig. (2-tailed)	.478	.253	.156	.116	.748	.621	.290	.891
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	.219	.284	.310	.345	.091	.083	.215	-.035
FITD_8k	Sig. (2-tailed)	.199	.104	.070	.045	.598	.632	.215	.838
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	.226	.319	.344	.350	.058	.084	.164	-.023
FITD_12k	Sig. (2-tailed)	.199	.066	.050	.050	.746	.636	.354	.897
	N	34	34	33	32	34	34	34	34
	Pearson Correlation	.142	.193	.284	.238	-.011	.022	.128	-.088
FITD_14k	Sig. (2-tailed)	.416	.281	.098	.182	.948	.899	.470	.616
	N	35	33	35	33	35	35	34	35
	Pearson Correlation	.112	.255	.285	.206	.002	.061	.131	-.127
FITD_PostSL	Sig. (2-tailed)	.529	.158	.109	.241	.992	.731	.466	.474
	N	34	32	33	34	34	34	33	34

Correlation matrix among all variables for the control subjects, continued.

		FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k	ESQams_PostSL
PLBPM_12k	Pearson Correlation	.092	-.062	-.126	-.152	-.047	-.274
	Sig. (2-tailed)	.594	.721	.464	.376	.786	.105
	N	36	36	36	36	36	36
PLBPM_14k	Pearson Correlation	.190	.028	-.025	-.051	.083	-.210
	Sig. (2-tailed)	.268	.869	.887	.769	.629	.220
	N	36	36	36	36	36	36
PLBPM_PostSL	Pearson Correlation	.151	-.086	-.104	-.133	-.009	-.267
	Sig. (2-tailed)	.381	.618	.546	.439	.957	.116
	N	36	36	36	36	36	36
FITD_PreSL	Pearson Correlation	.108	.143	.215	.240	.238	.072
	Sig. (2-tailed)	.529	.404	.207	.159	.162	.677
	N	36	36	36	36	36	36
FITD_8k	Pearson Correlation	.098	.143	.163	.166	.170	.012
	Sig. (2-tailed)	.571	.405	.341	.333	.321	.944
	N	36	36	36	36	36	36
FITD_12k	Pearson Correlation	.127	.090	.165	.215	.165	.028
	Sig. (2-tailed)	.474	.614	.350	.221	.350	.874
	N	34	34	34	34	34	34
FITD_14k	Pearson Correlation	.049	.098	.134	.143	.111	.023
	Sig. (2-tailed)	.782	.577	.443	.412	.524	.894
	N	35	35	35	35	35	35
FITD_PostSL	Pearson Correlation	.035	.128	.402	.370	.376	.152
	Sig. (2-tailed)	.844	.472	.018	.031	.028	.390
	N	34	34	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
FITA_PreSL	Pearson Correlation	.213	-.270	.072	-.122	-.139	-.068	-.035	.024
	Sig. (2-tailed)	.213	.111	.678	.479	.420	.692	.838	.891
	N	36	36	36	36	36	36	36	36
FITA_8k	Pearson Correlation	.214	-.280	.078	-.116	-.019	-.124	-.032	.038
	Sig. (2-tailed)	.210	.098	.651	.500	.911	.471	.852	.824
	N	36	36	36	36	36	36	36	36
FITA_12k	Pearson Correlation	.280	-.294	.111	-.105	-.048	-.085	-.024	.011
	Sig. (2-tailed)	.109	.091	.531	.553	.790	.634	.892	.953
	N	34	34	34	34	34	34	34	34
FITA_14k	Pearson Correlation	.187	-.137	.215	-.227	-.117	.022	-.058	-.007
	Sig. (2-tailed)	.281	.432	.215	.190	.503	.899	.741	.969
	N	35	35	35	35	35	35	35	35
FITA_PostSL	Pearson Correlation	.227	-.429	-.182	-.241	-.267	-.007	.004	.118
	Sig. (2-tailed)	.197	.011	.302	.170	.128	.970	.981	.505
	N	34	34	34	34	34	34	34	34
FITL_PreSL	Pearson Correlation	-.017	.187	.098	-.009	.167	.269	.299	-.019
	Sig. (2-tailed)	.920	.276	.569	.957	.329	.112	.077	.913
	N	36	36	36	36	36	36	36	36
FITL_8k	Pearson Correlation	-.057	.249	.089	.021	.153	.323	.226	-.005
	Sig. (2-tailed)	.741	.143	.605	.903	.373	.055	.184	.977
	N	36	36	36	36	36	36	36	36
FITL_12k	Pearson Correlation	-.076	.233	.023	-.023	.157	.320	.189	.067
	Sig. (2-tailed)	.668	.184	.899	.898	.374	.065	.284	.707
	N	34	34	34	34	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		BMI	OX_PreSL	OX_8k	OX_12k	OX_14k	OX_PostSL	PLBPM_PreSL	PLBPM_8k
	Pearson Correlation	-.049	.020	.212	.010	-.031	.347	.049	.044
FITA_PreSL	Sig. (2-tailed)	.778	.909	.214	.953	.857	.038	.775	.799
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.039	.133	.245	.049	.093	.313	.114	.129
FITA_8k	Sig. (2-tailed)	.820	.441	.149	.777	.591	.063	.506	.452
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.017	.113	.256	.162	.120	.367	.106	.130
FITA_12k	Sig. (2-tailed)	.925	.526	.144	.360	.500	.033	.550	.462
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	-.026	.002	.335	.143	.267	.250	.121	.100
FITA_14k	Sig. (2-tailed)	.883	.993	.049	.412	.121	.148	.490	.568
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	-.062	-.004	.097	-.186	.024	.249	-.206	-.230
FITA_PostSL	Sig. (2-tailed)	.730	.983	.586	.293	.891	.156	.242	.191
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	.239	-.149	-.367	-.280	-.132	-.541	.084	.092
FITL_PreSL	Sig. (2-tailed)	.160	.385	.028	.098	.444	.001	.628	.592
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.192	-.173	-.362	-.309	-.148	-.575	.059	.052
FITL_8k	Sig. (2-tailed)	.263	.312	.030	.066	.389	.000	.730	.761
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.135	-.192	-.350	-.355	-.123	-.582	.068	.066
FITL_12k	Sig. (2-tailed)	.445	.276	.043	.039	.487	.000	.701	.711
	N	34	34	34	34	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL	FITD_8k	FITD_12k	FITD_14k
FITA_PreSL	Pearson Correlation	.036	.009	.008	.119	.065	.028	-.001
	Sig. (2-tailed)	.834	.957	.964	.488	.707	.874	.995
	N	36	36	36	36	36	34	35
FITA_8k	Pearson Correlation	.085	.073	.086	.142	.142	.112	.036
	Sig. (2-tailed)	.621	.673	.617	.408	.408	.529	.835
	N	36	36	36	36	36	34	35
FITA_12k	Pearson Correlation	.105	.088	.120	.113	.119	.061	.030
	Sig. (2-tailed)	.554	.619	.500	.525	.504	.731	.869
	N	34	34	34	34	34	34	33
FITA_14k	Pearson Correlation	.049	.013	.076	.019	.047	.021	.045
	Sig. (2-tailed)	.779	.942	.665	.913	.787	.907	.797
	N	35	35	35	35	35	33	35
FITA_PostSL	Pearson Correlation	-.252	-.260	-.186	-.041	-.039	-.066	-.097
	Sig. (2-tailed)	.150	.137	.291	.820	.827	.719	.593
	N	34	34	34	34	34	32	33
FITL_PreSL	Pearson Correlation	.122	.105	.104	.131	.213	.193	.116
	Sig. (2-tailed)	.478	.544	.546	.447	.212	.274	.508
	N	36	36	36	36	36	34	35
FITL_8k	Pearson Correlation	.090	.059	.023	.122	.219	.226	.142
	Sig. (2-tailed)	.602	.733	.893	.478	.199	.199	.416
	N	36	36	36	36	36	34	35
FITL_12k	Pearson Correlation	.086	.062	.032	.202	.284	.319	.193
	Sig. (2-tailed)	.627	.728	.858	.253	.104	.066	.281
	N	34	34	34	34	34	34	33

Correlation matrix among all variables for the control subjects, continued.

		FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k	FITA_PostSL	FITL_PreSL
FITA_PreSL	Pearson Correlation	.005	1	.844	.873	.779	.832	-.486
	Sig. (2-tailed)	.977		.000	.000	.000	.000	.003
	N	34	36	36	34	35	34	36
FITA_8k	Pearson Correlation	.096	.844	1	.907	.787	.859	-.444
	Sig. (2-tailed)	.590	.000		.000	.000	.000	.007
	N	34	36	36	34	35	34	36
FITA_12k	Pearson Correlation	.023	.873	.907	1	.825	.840	-.428
	Sig. (2-tailed)	.899	.000	.000		.000	.000	.011
	N	32	34	34	34	33	32	34
FITA_14k	Pearson Correlation	-.039	.779	.787	.825	1	.793	-.512
	Sig. (2-tailed)	.831	.000	.000	.000		.000	.002
	N	33	35	35	33	35	33	35
FITA_PostSL	Pearson Correlation	-.034	.832	.859	.840	.793	1	-.299
	Sig. (2-tailed)	.850	.000	.000	.000	.000		.086
	N	34	34	34	32	33	34	34
FITL_PreSL	Pearson Correlation	.128	-.486	-.444	-.428	-.512	-.299	1
	Sig. (2-tailed)	.470	.003	.007	.011	.002	.086	
	N	34	36	36	34	35	34	36
FITL_8k	Pearson Correlation	.112	-.436	-.508	-.460	-.457	-.390	.924
	Sig. (2-tailed)	.529	.008	.002	.006	.006	.022	.000
	N	34	36	36	34	35	34	36
FITL_12k	Pearson Correlation	.255	-.446	-.389	-.452	-.484	-.314	.925
	Sig. (2-tailed)	.158	.008	.023	.007	.004	.080	.000
	N	32	34	34	34	33	32	34

Correlation matrix among all variables for the control subjects, continued.

		FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k	FITV_12k	FITV_14k
FITA_PreSL	Pearson Correlation	-.436	-.446	-.407	-.204	.122	.122	.067	-.029
	Sig. (2-tailed)	.008	.008	.015	.248	.479	.480	.704	.869
	N	36	34	35	34	36	36	35	36
FITA_8k	Pearson Correlation	-.508	-.389	-.362	-.190	.117	.077	.090	-.160
	Sig. (2-tailed)	.002	.023	.033	.281	.496	.654	.608	.350
	N	36	34	35	34	36	36	35	36
FITA_12k	Pearson Correlation	-.460	-.452	-.398	-.191	.154	.113	.062	-.045
	Sig. (2-tailed)	.006	.007	.022	.296	.384	.523	.726	.798
	N	34	34	33	32	34	34	34	34
FITA_14k	Pearson Correlation	-.457	-.484	-.487	-.326	-.030	-.165	-.098	-.183
	Sig. (2-tailed)	.006	.004	.003	.064	.864	.345	.582	.292
	N	35	33	35	33	35	35	34	35
FITA_PostSL	Pearson Correlation	-.390	-.314	-.269	-.310	-.021	-.040	-.036	-.198
	Sig. (2-tailed)	.022	.080	.130	.074	.905	.824	.842	.261
	N	34	32	33	34	34	34	33	34
FITL_PreSL	Pearson Correlation	.924	.925	.881	.911	.033	-.010	.057	.105
	Sig. (2-tailed)	.000	.000	.000	.000	.848	.952	.745	.542
	N	36	34	35	34	36	36	35	36
FITL_8k	Pearson Correlation	1	.922	.868	.919	-.007	-.091	-.028	.096
	Sig. (2-tailed)		.000	.000	.000	.967	.597	.871	.578
	N	36	34	35	34	36	36	35	36
FITL_12k	Pearson Correlation	.922	1	.920	.940	.008	-.035	.020	.050
	Sig. (2-tailed)	.000		.000	.000	.964	.844	.911	.781
	N	34	34	33	32	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k	ESQams_PostSL
FITA_PreSL	Pearson Correlation	.087	-.138	-.056	.114	-.117	.180
	Sig. (2-tailed)	.614	.424	.745	.506	.495	.293
	N	36	36	36	36	36	36
FITA_8k	Pearson Correlation	.068	-.065	-.137	-.040	-.117	-.025
	Sig. (2-tailed)	.694	.706	.425	.817	.498	.883
	N	36	36	36	36	36	36
FITA_12k	Pearson Correlation	.082	-.063	-.133	-.026	-.137	.011
	Sig. (2-tailed)	.643	.723	.454	.886	.441	.952
	N	34	34	34	34	34	34
FITA_14k	Pearson Correlation	-.068	-.033	-.258	-.160	-.281	-.040
	Sig. (2-tailed)	.697	.849	.135	.358	.103	.817
	N	35	35	35	35	35	35
FITA_PostSL	Pearson Correlation	-.032	-.003	-.107	.094	-.142	.205
	Sig. (2-tailed)	.855	.989	.548	.596	.424	.245
	N	34	34	34	34	34	34
FITL_PreSL	Pearson Correlation	-.095	.112	.165	.207	.197	.139
	Sig. (2-tailed)	.582	.517	.336	.226	.249	.420
	N	36	36	36	36	36	36
FITL_8k	Pearson Correlation	-.173	.054	.187	.228	.165	.200
	Sig. (2-tailed)	.314	.753	.275	.181	.335	.243
	N	36	36	36	36	36	36
FITL_12k	Pearson Correlation	-.138	.076	.161	.255	.215	.159
	Sig. (2-tailed)	.436	.668	.363	.146	.222	.369
	N	34	34	34	34	34	34

Correlation matrix among all variables for the control subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
FITL_14k	Pearson Correlation	-.088	.123	-.039	-.040	.115	.264	.199	.103
	Sig. (2-tailed)	.617	.481	.824	.818	.509	.125	.253	.555
	N	35	35	35	35	35	35	35	35
FITL_PostSL	Pearson Correlation	-.103	.257	.181	.072	.279	.173	.200	-.089
	Sig. (2-tailed)	.562	.143	.305	.687	.110	.329	.257	.618
	N	34	34	34	34	34	34	34	34
FITV_PreSL	Pearson Correlation	.067	-.069	.093	.292	.339	.201	.270	-.326
	Sig. (2-tailed)	.697	.688	.588	.084	.043	.240	.112	.052
	N	36	36	36	36	36	36	36	36
FITV_8k	Pearson Correlation	.139	-.079	.048	.234	.252	.008	.069	-.235
	Sig. (2-tailed)	.419	.647	.782	.169	.138	.962	.690	.168
	N	36	36	36	36	36	36	36	36
FITV_12k	Pearson Correlation	.159	-.092	.098	.224	.317	.025	.150	-.284
	Sig. (2-tailed)	.362	.598	.576	.196	.064	.885	.389	.098
	N	35	35	35	35	35	35	35	35
FITV_14k	Pearson Correlation	.061	.098	.150	.279	.303	.190	.220	-.302
	Sig. (2-tailed)	.724	.571	.384	.099	.072	.267	.197	.074
	N	36	36	36	36	36	36	36	36
FITV_PostSL	Pearson Correlation	.104	-.185	-.028	.151	.254	-.001	.058	-.190
	Sig. (2-tailed)	.547	.280	.873	.380	.136	.996	.737	.267
	N	36	36	36	36	36	36	36	36
ESQams_PreSL	Pearson Correlation	.618	-.260	-.044	-.409	-.164	.245	-.162	-.369
	Sig. (2-tailed)	.000	.125	.799	.013	.340	.149	.346	.027
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		BMI	OX_PreSL	OX_8k	OX_12k	OX_14k	OX_PostSL	PLBPM_PreSL	PLBPM_8k
	Pearson Correlation	.114	-.206	-.338	-.240	-.072	-.524	-.002	.015
FITL_14k	Sig. (2-tailed)	.515	.235	.047	.165	.680	.001	.993	.934
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	.205	-.062	-.076	-.073	.029	-.491	.213	.230
FITL_PostSL	Sig. (2-tailed)	.244	.726	.668	.683	.871	.003	.227	.190
	N	34	34	34	34	34	34	34	34
	Pearson Correlation	.302	.000	.104	.037	.095	.084	.185	.210
FITV_PreSL	Sig. (2-tailed)	.073	.998	.547	.830	.582	.627	.281	.219
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.096	.119	.099	.180	.077	.203	.137	.164
FITV_8k	Sig. (2-tailed)	.576	.488	.566	.294	.656	.235	.427	.338
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.201	.096	.124	.158	.130	.089	.153	.180
FITV_12k	Sig. (2-tailed)	.247	.583	.477	.366	.457	.612	.381	.302
	N	35	35	35	35	35	35	35	35
	Pearson Correlation	.259	.006	.105	.181	.123	.105	.151	.206
FITV_14k	Sig. (2-tailed)	.127	.972	.543	.291	.476	.542	.379	.229
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	.044	.036	.139	.292	.108	.238	.020	.072
FITV_PostSL	Sig. (2-tailed)	.798	.833	.418	.084	.532	.162	.908	.677
	N	36	36	36	36	36	36	36	36
	Pearson Correlation	-.060	.364	.165	.041	-.059	.123	-.127	-.067
ESQams_PreSL	Sig. (2-tailed)	.727	.029	.335	.811	.731	.474	.460	.698
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL	FITD_8k	FITD_12k	FITD_14k
FITL_14k	Pearson Correlation	.049	.041	-.001	.245	.310	.344	.284
	Sig. (2-tailed)	.780	.817	.995	.156	.070	.050	.098
	N	35	35	35	35	35	33	35
FITL_PostSL	Pearson Correlation	.242	.222	.160	.274	.345	.350	.238
	Sig. (2-tailed)	.168	.207	.367	.116	.045	.050	.182
	N	34	34	34	34	34	32	33
FITV_PreSL	Pearson Correlation	.200	.257	.270	.055	.091	.058	-.011
	Sig. (2-tailed)	.241	.130	.112	.748	.598	.746	.948
	N	36	36	36	36	36	34	35
FITV_8k	Pearson Correlation	.133	.197	.207	.085	.083	.084	.022
	Sig. (2-tailed)	.439	.248	.226	.621	.632	.636	.899
	N	36	36	36	36	36	34	35
FITV_12k	Pearson Correlation	.157	.242	.238	.184	.215	.164	.128
	Sig. (2-tailed)	.369	.162	.169	.290	.215	.354	.470
	N	35	35	35	35	35	34	34
FITV_14k	Pearson Correlation	.209	.237	.193	-.024	-.035	-.023	-.088
	Sig. (2-tailed)	.221	.165	.259	.891	.838	.897	.616
	N	36	36	36	36	36	34	35
FITV_PostSL	Pearson Correlation	.092	.190	.151	.108	.098	.127	.049
	Sig. (2-tailed)	.594	.268	.381	.529	.571	.474	.782
	N	36	36	36	36	36	34	35
ESQams_PreSL	Pearson Correlation	-.062	.028	-.086	.143	.143	.090	.098
	Sig. (2-tailed)	.721	.869	.618	.404	.405	.614	.577
	N	36	36	36	36	36	34	35

Correlation matrix among all variables for the control subjects, continued.

		FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k	FITA_PostSL	FITL_PreSL
FITL_14k	Pearson Correlation	.285	-.407	-.362	-.398	-.487	-.269	.881
	Sig. (2-tailed)	.109	.015	.033	.022	.003	.130	.000
	N	33	35	35	33	35	33	35
FITL_PostSL	Pearson Correlation	.206	-.204	-.190	-.191	-.326	-.310	.911
	Sig. (2-tailed)	.241	.248	.281	.296	.064	.074	.000
	N	34	34	34	32	33	34	34
FITV_PreSL	Pearson Correlation	.002	.122	.117	.154	-.030	-.021	.033
	Sig. (2-tailed)	.992	.479	.496	.384	.864	.905	.848
	N	34	36	36	34	35	34	36
FITV_8k	Pearson Correlation	.061	.122	.077	.113	-.165	-.040	-.010
	Sig. (2-tailed)	.731	.480	.654	.523	.345	.824	.952
	N	34	36	36	34	35	34	36
FITV_12k	Pearson Correlation	.131	.067	.090	.062	-.098	-.036	.057
	Sig. (2-tailed)	.466	.704	.608	.726	.582	.842	.745
	N	33	35	35	34	34	33	35
FITV_14k	Pearson Correlation	-.127	-.029	-.160	-.045	-.183	-.198	.105
	Sig. (2-tailed)	.474	.869	.350	.798	.292	.261	.542
	N	34	36	36	34	35	34	36
FITV_PostSL	Pearson Correlation	.035	.087	.068	.082	-.068	-.032	-.095
	Sig. (2-tailed)	.844	.614	.694	.643	.697	.855	.582
	N	34	36	36	34	35	34	36
ESQams_PreSL	Pearson Correlation	.128	-.138	-.065	-.063	-.033	-.003	.112
	Sig. (2-tailed)	.472	.424	.706	.723	.849	.989	.517
	N	34	36	36	34	35	34	36

Correlation matrix among all variables for the control subjects, continued.

		FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k	FITV_12k	FITV_14k
	Pearson Correlation	.868	.920	1	.922	.038	-.032	.039	.035
FITL_14k	Sig. (2-tailed)	.000	.000		.000	.827	.857	.827	.842
	N	35	33	35	33	35	35	34	35
	Pearson Correlation	.919	.940	.922	1	.215	.142	.192	.234
FITL_PostSL	Sig. (2-tailed)	.000	.000	.000		.223	.424	.285	.182
	N	34	32	33	34	34	34	33	34
	Pearson Correlation	-.007	.008	.038	.215	1	.855	.868	.821
FITV_PreSL	Sig. (2-tailed)	.967	.964	.827	.223		.000	.000	.000
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	-.091	-.035	-.032	.142	.855	1	.908	.851
FITV_8k	Sig. (2-tailed)	.597	.844	.857	.424	.000		.000	.000
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	-.028	.020	.039	.192	.868	.908	1	.794
FITV_12k	Sig. (2-tailed)	.871	.911	.827	.285	.000	.000		.000
	N	35	34	34	33	35	35	35	35
	Pearson Correlation	.096	.050	.035	.234	.821	.851	.794	1
FITV_14k	Sig. (2-tailed)	.578	.781	.842	.182	.000	.000	.000	
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	-.173	-.138	-.057	.029	.813	.833	.871	.774
FITV_PostSL	Sig. (2-tailed)	.314	.436	.747	.872	.000	.000	.000	.000
	N	36	34	35	34	36	36	35	36
	Pearson Correlation	.054	.076	.066	.000	.024	.159	.187	.220
ESQams_PreSL	Sig. (2-tailed)	.753	.668	.708	.999	.891	.353	.281	.197
	N	36	34	35	34	36	36	35	36

Correlation matrix among all variables for the control subjects, continued.

		FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k	ESQams_PostSL
FITL_14k	Pearson Correlation	-.057	.066	.176	.198	.142	.135
	Sig. (2-tailed)	.747	.708	.311	.254	.416	.439
	N	35	35	35	35	35	35
FITL_PostSL	Pearson Correlation	.029	.000	.168	.256	.136	.200
	Sig. (2-tailed)	.872	.999	.343	.144	.442	.256
	N	34	34	34	34	34	34
FITV_PreSL	Pearson Correlation	.813	.024	.017	-.014	-.046	-.047
	Sig. (2-tailed)	.000	.891	.924	.933	.791	.784
	N	36	36	36	36	36	36
FITV_8k	Pearson Correlation	.833	.159	.171	.171	.072	.064
	Sig. (2-tailed)	.000	.353	.318	.318	.677	.709
	N	36	36	36	36	36	36
FITV_12k	Pearson Correlation	.871	.187	.128	.088	.001	.027
	Sig. (2-tailed)	.000	.281	.465	.616	.995	.878
	N	35	35	35	35	35	35
FITV_14k	Pearson Correlation	.774	.220	.123	.121	.000	.091
	Sig. (2-tailed)	.000	.197	.473	.481	.998	.598
	N	36	36	36	36	36	36
FITV_PostSL	Pearson Correlation	1	.194	.133	.064	.060	-.056
	Sig. (2-tailed)		.257	.438	.712	.730	.745
	N	36	36	36	36	36	36
ESQams_PreSL	Pearson Correlation	.194	1	.661	.512	.544	.492
	Sig. (2-tailed)	.257		.000	.001	.001	.002
	N	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		Sex	Age	Pulse	BPsystolic	BPDiastolic	Respiration	Weight	Height_inches
ESQams_8k	Pearson Correlation	.513	-.417	-.122	-.224	-.069	.072	-.186	-.194
	Sig. (2-tailed)	.001	.011	.478	.190	.687	.677	.277	.258
	N	36	36	36	36	36	36	36	36
ESQams_12k	Pearson Correlation	.511	-.350	-.136	-.332	-.130	.170	-.241	-.152
	Sig. (2-tailed)	.001	.036	.431	.048	.449	.323	.156	.378
	N	36	36	36	36	36	36	36	36
ESQams_14k	Pearson Correlation	.489	-.347	-.074	-.297	-.111	.101	-.293	-.204
	Sig. (2-tailed)	.002	.038	.669	.078	.517	.557	.083	.232
	N	36	36	36	36	36	36	36	36
ESQams_PostSL	Pearson Correlation	.510	-.182	-.141	-.429	-.239	.224	-.278	-.230
	Sig. (2-tailed)	.001	.289	.413	.009	.160	.188	.100	.178
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		BMI	OX_PreSL	OX_8k	OX_12k	OX_14k	OX_PostSL	PLBPM_PreSL	PLBPM_8k
ESQams_8k	Pearson Correlation	-.149	.436	.100	-.049	-.142	.201	-.155	-.139
	Sig. (2-tailed)	.385	.008	.560	.778	.410	.239	.367	.419
	N	36	36	36	36	36	36	36	36
ESQams_12k	Pearson Correlation	-.219	.333	.129	-.104	-.163	.158	-.152	-.162
	Sig. (2-tailed)	.200	.047	.453	.545	.342	.356	.378	.346
	N	36	36	36	36	36	36	36	36
ESQams_14k	Pearson Correlation	-.245	.359	.089	-.113	-.218	.135	-.073	-.066
	Sig. (2-tailed)	.150	.031	.607	.511	.201	.432	.673	.702
	N	36	36	36	36	36	36	36	36
ESQams_PostSL	Pearson Correlation	-.200	.259	.230	-.167	-.082	.080	-.229	-.281
	Sig. (2-tailed)	.241	.126	.177	.329	.634	.642	.180	.097
	N	36	36	36	36	36	36	36	36

Correlation matrix among all variables for the control subjects, continued.

		PLBPM_12k	PLBPM_14k	PLBPM_PostSL	FITD_PreSL	FITD_8k	FITD_12k	FITD_14k
	Pearson Correlation	-.126	-.025	-.104	.215	.163	.165	.134
ESQams_8k	Sig. (2-tailed)	.464	.887	.546	.207	.341	.350	.443
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.152	-.051	-.133	.240	.166	.215	.143
ESQams_12k	Sig. (2-tailed)	.376	.769	.439	.159	.333	.221	.412
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.047	.083	-.009	.238	.170	.165	.111
ESQams_14k	Sig. (2-tailed)	.786	.629	.957	.162	.321	.350	.524
	N	36	36	36	36	36	34	35
	Pearson Correlation	-.274	-.210	-.267	.072	.012	.028	.023
ESQams_PostSL	Sig. (2-tailed)	.105	.220	.116	.677	.944	.874	.894
	N	36	36	36	36	36	34	35

Correlation matrix among all variables for the control subjects, continued.

		FITD_PostSL	FITA_PreSL	FITA_8k	FITA_12k	FITA_14k	FITA_PostSL	FITL_PreSL
	Pearson Correlation	.402	-.056	-.137	-.133	-.258	-.107	.165
ESQams_8k	Sig. (2-tailed)	.018	.745	.425	.454	.135	.548	.336
	N	34	36	36	34	35	34	36
	Pearson Correlation	.370	.114	-.040	-.026	-.160	.094	.207
ESQams_12k	Sig. (2-tailed)	.031	.506	.817	.886	.358	.596	.226
	N	34	36	36	34	35	34	36
	Pearson Correlation	.376	-.117	-.117	-.137	-.281	-.142	.197
ESQams_14k	Sig. (2-tailed)	.028	.495	.498	.441	.103	.424	.249
	N	34	36	36	34	35	34	36
	Pearson Correlation	.152	.180	-.025	.011	-.040	.205	.139
ESQams_PostSL	Sig. (2-tailed)	.390	.293	.883	.952	.817	.245	.420
	N	34	36	36	34	35	34	36

Correlation matrix among all variables for the control subjects, continued.

		FITL_8k	FITL_12k	FITL_14k	FITL_PostSL	FITV_PreSL	FITV_8k	FITV_12k	FITV_14k
ESQams_8k	Pearson Correlation	.187	.161	.176	.168	.017	.171	.128	.123
	Sig. (2-tailed)	.275	.363	.311	.343	.924	.318	.465	.473
	N	36	34	35	34	36	36	35	36
ESQams_12k	Pearson Correlation	.228	.255	.198	.256	-.014	.171	.088	.121
	Sig. (2-tailed)	.181	.146	.254	.144	.933	.318	.616	.481
	N	36	34	35	34	36	36	35	36
ESQams_14k	Pearson Correlation	.165	.215	.142	.136	-.046	.072	.001	.000
	Sig. (2-tailed)	.335	.222	.416	.442	.791	.677	.995	.998
	N	36	34	35	34	36	36	35	36
ESQams_PostSL	Pearson Correlation	.200	.159	.135	.200	-.047	.064	.027	.091
	Sig. (2-tailed)	.243	.369	.439	.256	.784	.709	.878	.598
	N	36	34	35	34	36	36	35	36

Correlation matrix among all variables for the control subjects, continued.

		FITV_PostSL	ESQams_PreSL	ESQams_8k	ESQams_12k	ESQams_14k	ESQams_PostSL
ESQams_8k	Pearson Correlation	.133	.661	1	.851	.853	.686
	Sig. (2-tailed)	.438	.000		.000	.000	.000
	N	36	36	36	36	36	36
ESQams_12k	Pearson Correlation	.064	.512	.851	1	.848	.838
	Sig. (2-tailed)	.712	.001	.000		.000	.000
	N	36	36	36	36	36	36
ESQams_14k	Pearson Correlation	.060	.544	.853	.848	1	.640
	Sig. (2-tailed)	.730	.001	.000	.000		.000
	N	36	36	36	36	36	36
ESQams_PostSL	Pearson Correlation	-.056	.492	.686	.838	.640	1
	Sig. (2-tailed)	.745	.002	.000	.000	.000	
	N	36	36	36	36	36	36

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